NASA TECHNICAL
MEMORANDUM

NASA TM X-58029
June 1969

SCIENCE SCREENING REPORT OF THE APOLLO 7 MISSION 70-MILLIMETER PHOTOGRAPHY AND NASA EARTH RESOURCES AIRCRAFT MISSION 981 PHOTOGRAPHY

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

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ABSTRACT

Scientists representing disciplines related to earth resources present preliminary interpretations of the 70-millimeter photography taken by the crew of the Apollo 7 spacecraft. The photographs are compared with photographs taken at conventional aircraft altitudes and are evaluated regarding applications. The individual photographic frames were examined with reference to important interpretation parameters. Uses and benefits in the areas of land-use planning, cartographic production, weather forecasting, oceanographic studies, regional geology, hydrological analyses, and agricultural surveys are described.

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I. SUMMARY

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EARTH RESOURCES BRIEFING AND SCIENCE SCREENING OF THE APOLLO 7 MISSION 70-MILLIMETER PHOTOGRAPHY AND NASA EARTH RESOURCES AIRCRAFT MISSION 981 PHOTOGRAPHY

An earth resources briefing and science screening of the Apollo 7 mission 70-mm photography and NASA Earth Resources Aircraft Mission 981 photography was held at the NASA Manned Spacecraft Center (MSC) on November 14 and 15, 1968. The Earth Resources Division (ERD), Science and Applications Directorate (S&AD), with support from the Mapping Sciences Laboratory (MSL), was responsible for conducting this briefing, for the science screening, and for subsequent dissemination of the photography. The primary purpose of the preliminary screening was to permit invited scientists and photographic interpreters from other NASA centers, user agencies, and academic institutions to study and evaluate orbital and related aircraft photography for possible use in the meteorology and earth resources disciplines.

On the morning of November 14, initial briefings on the photography were given to 24 visiting scientists and approximately 20 MSC scientists. After these briefings, the scientists, representing their respective disciplines, met with ERD Scientific Discipline Group Leaders at the MSL for the science screening of the Apollo 7 photography and the NASA Earth Resources Aircraft Mission 981 photography. Upon completion of the science screening, user agency representatives and other invitees were asked to provide, individually or by scientific discipline group, written contributions to be compiled into a Science Screening Report by the ERD. The following comments represent a summary of the science screening contributions of the photography.

APOLLO 7 PHOTOGRAPHY

Science Discipline Evaluation

Geology. - For geologic utility, the Apollo 7 photography must be considered more comparable to Gemini photography than to Apollo 6 photography. As a result of the obliquity of the majority of the views, true shapes of surface features tend to be distorted or obscured. In geology, the main use of oblique photography is to show an introductory view, or a complementing view to vertical photography.

Oceanography. - The repetition of the Apollo 7 photography over certain areas, such as the Gulf of California, affords the opportunity for viewing of specific areas

under different camera angles, sun angles, and atmospheric conditions and also provides a record of dynamic feature changes. For example, sea-surface patterns in the Gulf of California are enhanced by sunglint on this photography and were not evident on previous space photography which shows no sunglint.

Hydrology. - For hydrologic purposes, the Apollo 7 photography, although less useful because of the many oblique views, will be useful for the following purposes:

1. General descriptive hydrology of river basins, lakes, irrigated land uses, et cetera.

2. Qualitative analysis of bottom topography and sediment transport using the more oblique views that occur near sunglint areas.

3. Semiquantitative measurements of bottom topography and sediment transport using the near-vertical photography in which sunglint is not very close to the area of interest.

Agriculture-forestry-rangeland resources. - Brushlands, timberlands, and grasslands can be fairly well differentiated on some of the views of the southwestern United States. A few of the photographs, although they are oblique views, are useful for evaluation of vegetation and related resource features.

Geography. - The two major areas of use of the Apollo 7 photography in geography are in urban analysis and in land-use and regional planning. A land-use study of the internal structure of New Orleans can be made, and land-use and regional planning studies from space photography of the Imperial Valley and the California coast can be continued.

Cartography. - The additional coverage of the Apollo 7 photography is of some value for photomosaic preparation, including extending the coverage of photomosaics and photomaps compiled from Gemini and Apollo 6 photography. Certain areas covered by previous space photography can be studied to determine the value of this type of photography as a means of detecting changes for purposes of updating existing maps.

Meteorology. - Sufficient "cloud street" views occur in the Apollo 7 photography, over known locations and at known times, to provide useful information for the study of this phenomenon. Atmospheric dynamics can be studied from the views of Hurricane Gladys and Typhoon Gloria. Additional characteristics of sea-breeze effect, clearing over lakes and rivers, and structure over mesoscale systems can be gained from viewing this photography.

Photographic Image Quality Evaluation

Earth photography was not a primary objective of the Apollo 7 flight, and no provision was made for use of attitude control during photography. The following circumstances, which either degrade the image quality or reduce the effective potential of

orbital photography, are included as a guide for the planning and conducting of future missions.

1. Numerous frames were either overexposed or underexposed, and there appeared to be a lack of exposure uniformity between individual frames.

2. Emulsion streaks similar to those on the Apollo 6 photography were evident throughout the type SO-121 film.

3. Many of the photographs were high obliques which make photointerpretative analysis and measurement extremely difficult.

4. There were few of the sequential, stereoscopic photographs which are basic for most scientific analyses.

5. Certain water-land interfaces and desert areas of the world, which were previously photographed, were again photographed many times. These areas, although presenting spectacular views from space, have almost always been exposed in oblique and nonsequential views, which decreases their value for scientific analysis.

6. Eastman Kodak color duplicating film, type 5386, was used to duplicate transparencies from the original type SO-121 film. Although this film produces high-quality copies, type SO-118 duplicating film has been expressly designed to reproduce the high resolution of type SO-121 film.

Recommendations for Future Photographic Missions

Recommendations for future photographic missions include the following:

1. Spacecraft photographic missions should be planned in detail prior to the mission so that a photographic plan properly coordinated with the experiments and crew activities is available for training purposes.

2. The electric camera-shutter tripping mechanism should be integrated in some way with a recording system to correlate frame numbers with ground elapsed time (g. e. t.) and to determine a more exact spacecraft position at the instant a photograph is taken.

3. If possible, all photography to be used for scientific analysis should be taken in vertical or near-vertical orientation (image plane of camera parallel to ground) and with 60-percent overlap in the direction of flight.

4. A preplanning and a target-aiming chart with exposure data for specific sun elevations should be prepared. Experiments which differ radically from each other should be programed for acquisition in order not to interfere with experiments which require optimum exposure.

5. Photographs taken during the Gemini and Apollo missions can be used to study earth resources of a regional nature. For more detailed studies, higher resolution or multiband photography would be required.

6. Spacecraft windows should be designed so that they will permit a minimum of 50-percent transmission of the electromagnetic spectrum from approximately 0.4 to 0.9 micron.

7. Special care should be taken to reduce redundant oblique coverage of a specific target of opportunity. This recommendation does not suggest either elimination of the sequential, vertical, and stereoscopic coverage of an area for photographic analysis or redundancy designed to fulfill periodic objectives of certain experiments.

8. On future photographic missions, enough attitude-control fuel must be allotted to the photographic portion of the mission so that the spacecraft can be maneuvered and maintained in position for optimum photographic data acquisition.

NINETY-DAY SCIENCE REPORT

Representatives of the user agencies, NASA Goddard Space Flight Center, and other invitees were asked to participate in the preparation of a 90-day science report. The participating scientists were requested to forward to MSC by February 28, 1969, results of scientific analysis of the Apollo 7 photography within this time interval and conclusions reached regarding the value of the Apollo 7 space photography in the meteorology and earth resources disciplines. The Earth Resources Division plans to publish this 90-day science report on the Apollo 7 photography in a format similar to that used for the Apollo 6 mission science report.

II. INTRODUCTION

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On October 11, 1968, the National Aeronautics and Space Administration launched a manned spacecraft from Cape Kennedy, Florida. This flight, designated the Apollo 7 mission, orbited the earth 10.8 days and splashed down on October 22, 1968.

Two of the experiments scheduled during this mission were to obtain synoptic terrain photography and synoptic weather photography. The objectives of the Synoptic Terrain Photography Experiment were to obtain high-quality photographs (with color and black and white film) of selected land and ocean areas for geologic, geographic, and oceanographic study and to evaluate the relative effectiveness of color versus black and white film. Nadir photographs were desired, particularly in sequences of three or more overlapping frames. The objective of the Synoptic Weather Photography Experiment was to secure photographic coverage of as many as possible of the 27 basic categories of weather phenomena planned for coverage during the Apollo 7 mission.

For the experiments, a Hasselblad 500-C (NASA modified) 70-mm format camera was used with a Zeiss Planar, 80-mm-focal-length, f/2.8 lens. Kodak film types SO-368, SO-121, and 3400 were exposed, using Wratten 2A, 25A (red), and 58 (green) filters. More than 500 photographs (appendix A) were taken during the Apollo 7 mission.

Color, color infrared, and multiband photography taken during NASA Earth Resources Aircraft Mission 981 (appendix B) within a week prior to, during, and after the Apollo 7 flight (of selected areas in the southern United States) as well as U. S. Geological Survey (USGS) color photography flown during the Apollo 7 mission, was available for comparative studies with Gemini, Apollo 6, and Apollo 7 photography during the science screening on November 14 and 15, 1968.

III. APOLLO TRAJECTORY

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Orbital insertion occurred at approximately 10 min 27 sec g. e. t. into a 123- by 153-n. mi. ellipse. At 1 hr 46 min 30 sec g. e. t., the Saturn IVB (S-IVB) had completed its safing, and the ellipse was 123 by 167 n. mi. At 2 hr 55 min 2 sec g. e. t., the command and service module (CSM) separated from the S-IVB over Hawaii and stationkept over the United States. The first phasing maneuver to set up the rendezvous conditions 23 hours later occurred at 3 hr 20 min 10 sec g. e. t. This maneuver was a retrograde ΔV of 5.7 fps performed with the service module (SM) reaction control system (RCS). The SM was targeted to place the CSM approximately 75 n. mi. ahead of the S-IVB at 26 hr 25 min g. e. t. The resultant CSM ellipse was 122 by 164 n. mi.

During the next six revolutions, the S-IVB orbit was found to be decaying more rapidly than had been anticipated. This unexpected decay could have been caused by some type of venting through the J-2 engine, since the S-IVB was in a retrograde orbital rate attitude. A second phasing maneuver of 7 fps retrograde was therefore performed with the SM RCS at 15 hr 52 min g. e. t. The resultant ellipse was 120 by 165 n. mi.

The first secondary propulsion system (SPS) burn was a corrective combination maneuver which occurred at 26 hr 24 min 56 sec g. e. t., when the CSM was approximately 84 n. mi. ahead of the S-IVB. The duration of the external ΔV was 9.4 seconds and was targeted to achieve the proper phase and height offset at the time of the second SPS burn. The first SPS burn was nominal, with a resultant ellipse of 125 by 195 n. mi.

The second SPS burn was a coelliptic maneuver which occurred at 28 hr 0 min 56 sec g. e. t., when the CSM was approximately 82 n. mi. behind and 7.7 n. mi. below the S-IVB. The duration of the burn was 7.9 seconds. The burn was targeted to achieve a coelliptic orbit with the S-IVB. The resulting CSM 114- by 153-n. mi. elliptic orbit was approximately 8 n. mi. below the S-IVB.

The terminal phase initiation maneuver was performed at 29 hr 16 min 45 sec g. e. t. and used the onboard computer solution based on sextant tracking of the S-IVB. This 17-fps SM RCS burn was approximately 46 seconds in duration. Following a small midcourse maneuver at approximately 29 hr 28 min g. e. t., the pilots began the braking phase at approximately 29 hr 47 min g. e. t. with final rendezvous closure to approximately 70 feet occurring at about 30 hr g. e. t. The ellipse at rendezvous was 121 by 160 n. mi. Stationkeeping was terminated by a 2-fps SM RCS posigrade maneuver at 30 hr 20 min g. e. t.

The ellipse at the end of the rendezvous was 121 by 160 n. mi. The third SPS burn was targeted to lower perigee to 90 n. mi. and to place perigee in the northern hemisphere. This 9.0-second maneuver occurred at 75 hr 48 min 00.3 sec g.e.t. and resulted in a 90- by 160-n. mi. ellipse. This maneuver lowered perigee to well within the SM RCS deorbit capability and placed perigee in the northern hemisphere. The in-plane velocity required to obtain a 90- by 160-n. mi. ellipse was not sufficient to obtain a good stabilization control system (SCS) test; therefore, a ΔV of 200 fps was directed out of plane to the south. The SPS burn time allowed a good SCS test as well as adjusted the propellant level for the propellant utilization gaging system (PUGS) test on the fifth SPS burn.

The fourth SPS burn was an SPS minimum-impulse test of 0.5-second duration. This maneuver occurred at 120 hr 43 min 0 sec g.e.t. The velocity component was directed in-plane posigrade to raise perigee slightly. This maneuver resulted in a 90- by 156-n. mi. ellipse.

The fifth SPS burn was targeted to position the ground track at the end of the mission so that the primary revolution for the SPS deorbit burn (revolution 163) would have at least 2 minutes of Hawaii track and the next revolution would provide a backup SM RCS deorbit from apogee with touchdown occurring at a longitude of 60° west and north of the islands. This shift of the orbital plane was accomplished by the large out-of-plane component of velocity directed southward in combination with an orbital period adjustment. An overburn of approximately 50 fps occurred because of late cut-off, but did not perturb the trajectory significantly, and the target conditions were achieved. The fifth burn, a 67.1-second burn, occurred at 165 hr 0 min 0.47 sec g.e.t. with the resultant ellipse being 91 by 250 n. mi.

The sixth burn was a second SPS minimum-impulse test lasting 0.5 second. The maneuver, occurring at 210 hr 08 min 0.47 sec g.e.t. was directed out of plane since no change to the 90- by 236-n. mi. ellipse was desired.

The seventh SPS burn was targeted to place perigee in revolution 165 at a longitude of 53° west. This was accomplished by rotating the line of apsides approximately 30° to the west with the 7.7-second burn at 239 hr 6 min 11.97 sec g.e.t. The in-plane velocity required to obtain the desired rotation was all radial. To avoid the problems of executing a completely radial maneuver, a ΔV of 100 fps was directed out of plane to the north. The out-of-plane velocity increased the burn time, and a better SCS test was obtained.

The eighth SPS burn was the deorbit burn. This 11.8-second burn occurred over Hawaii at 259 hr 39 min 16.3 sec g.e.t. The spacecraft touched down approximately 30 minutes later at a latitude 27°38' north and a longitude 64°11' west.

IV. CAMERA SYSTEM

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Image quality varies widely from frame to frame, and the largest factor in poor quality is incorrect exposure. With proper exposure, image quality is very good. The high penetration characteristic of type SO-121 film, as compared to type 368 film, yields much better results when exposure is a factor. Though underexposure of type SO-121 film results in a magenta tint, many of the underexposed frames on this film hold details which should be recoverable with individual frame photographic reproduction techniques. Although time did not permit a detailed examination of Gemini and previous Apollo photography, the high ratio of oblique to vertical photography and the inconsistency of exposure indicate no significant overall advance in Apollo 7 photography.

Preliminary screening of the photography shows potential use of a number of the frames in a study of offshore topography, currents, sediment distribution, et cetera. Multispectral stratigraphic techniques would, in future photographic missions, be expected to enhance the amount of data available for study in oceanography, as well as geology, agriculture, and forestry. A more detailed study of the photography should indicate geographic areas of interest for further study by other techniques.

Future photographic missions would be expected to yield more data for earth resources studies if fuel could be expended to orient the space vehicle for vertical photography and if a team of scientists were consulted in the determination of areas to be photographed. A greater array of photographic equipment could be expected to yield a greater amount of data.

V. GEOLOGY

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THE APOLLO 7 TERRAIN PHOTOGRAPHY EXPERIMENT (S005)

Of the more than 500 photographs obtained during the Apollo 7 mission, approximately 200 are usable for the purposes of this experiment. In particular, a few near-vertical, high-sun-angle photographs of Baja California, other parts of Mexico, and portions of the Middle East will be useful for geologic studies. Photographs of New Orleans and Houston are better for geographic urban studies than those obtained on previous missions. The first extensive photographic coverage of northern Chile, Australia, and several other areas were obtained. A number of areas of oceanographic interest, particularly islands in the Pacific Ocean, were photographed for the first time. The objective of comparing color with black and white photography of the same areas was not successful because of problems with focus, exposure, and filters.

A hand-held, modified 70-mm Hasselblad 500C camera with an 80-mm focal-length lens was used for this photography experiment. Type SO-121 film was used for the synoptic weather and terrain experiments, and type SO-368 film was used for both the operational and the experiment photography. A type 2A filter was used with all but one of the magazines containing type SO-121 film, and no filter was used with type SO-368 film.

In general, the color and exposure quality of the pictures on type SO-368 film was excellent. Some problems were encountered in exposing type SO-121 film, and many frames were either underexposed or overexposed. The need to hurriedly change the film magazines, filters, and exposure settings when a target came into view probably accounts for the improper exposure of many frames. Another factor contributing to underexposure was the use of a 1° field-of-view spotmeter to determine exposure settings of the camera which has a field of view of approximately 52°. By using corrective photographic processing techniques, many of the exposure problems can be corrected.

Sharpness ranged from fair to excellent on both films, with steadiness in holding the camera a probable factor in those frames containing blurred images. Swells on the sea surface were resolved on both films.

Subsequent paragraphs describe regional areas and problems which are now under study by using the Apollo 7 photographs, as well as Gemini and Apollo 6 photography.

1. Geologic mapping of Baja California: Apollo 7 photography of this area in Mexico (fig. V-1) is considered, for geologic studies, superior in several ways to Gemini and Apollo 6 photography. The higher sun angle on the Apollo 7 imagery appears

low enough to prevent "washout" and still retain an adequate shadow pattern from the topography which is necessary for geologic structural mapping.

2. Structural geology of the Middle East: Several of the Apollo 7 photographs were taken over areas in the Middle East previously photographed during the Gemini flights. For the purpose of regional mapping, the Apollo 7 photography (fig. V-2) again shows the wealth of detail that can be observed of the topographic and geologic features.

3. Origin of the Carolina bays, United States: A number of elliptical bays can be observed on the Apollo 7 photography in southeast Brazil and in Louisiana (fig. V-3). Comparisons of these bays with the Carolina bays add further knowledge regarding the origin of the striking features, suggesting they were not formed by the impact of meteorites but by terrestrial processes.

4. Wind erosion in desert regions: The Apollo 7 photography complements the Gemini photography in large arid regions affected by natural forces (fig. V-4). Extensive areas of abraded rock knobs and ridges, sculptured and formed by wind containing the erosion agents, and areas of great sand plains and dunes can be further studied on the Apollo 7 photography to determine the actual importance and character of wind erosion in desert regions.

5. Coastal morphology: Apollo 7 photography covers a number of new shorelines and coastal features not previously photographed from space (fig. V-5), as well as several areas previously shown on the Gemini and Apollo 6 photographs. Studies will be made of changes in shorelines, river deltas, and submarine topography, by comparing space photographs with maps, charts, and hydrologic information currently available.

6. Rift valley tectonics: Photography taken at different oblique views, altitudes, and sun angles of the highlands bordering the Red Sea and the Gulf of Aqaba reveal structural conditions that may help determine the origin of the African rift valleys (fig. V-6). Preliminary study reveals no evidence of lateral displacement along the Dead Sea rift.

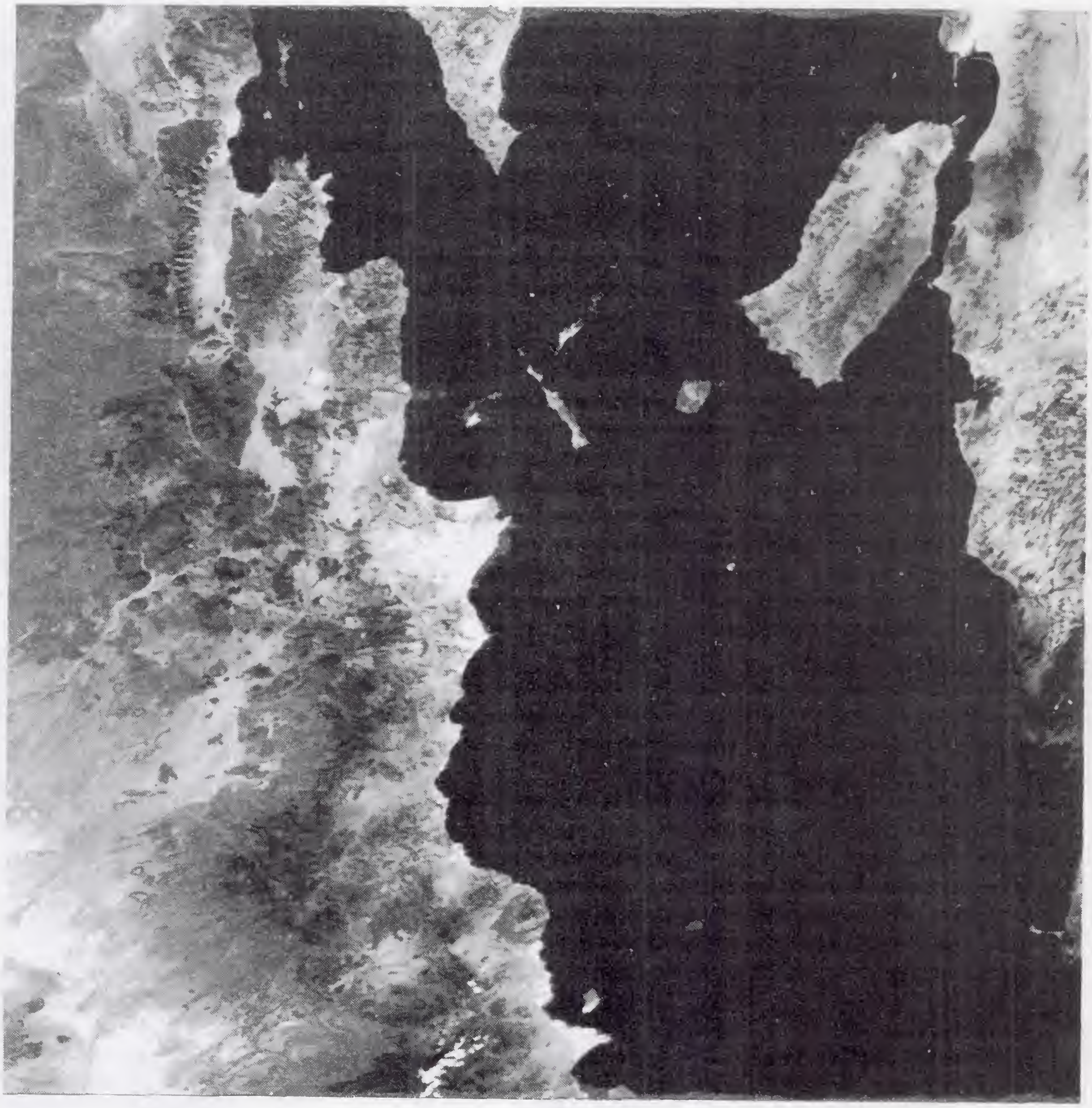

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Figure V-1. - Mexico, Gulf of California, central Baja California, mainland north of Guaymas.

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Figure V-2. - Iran, Persian Gulf coast.

AS7-4-1594

Figure V-3. - Brazil, Uruguay, Atlantic coast, Lagoa dos Patos, Lagoa Mirim.

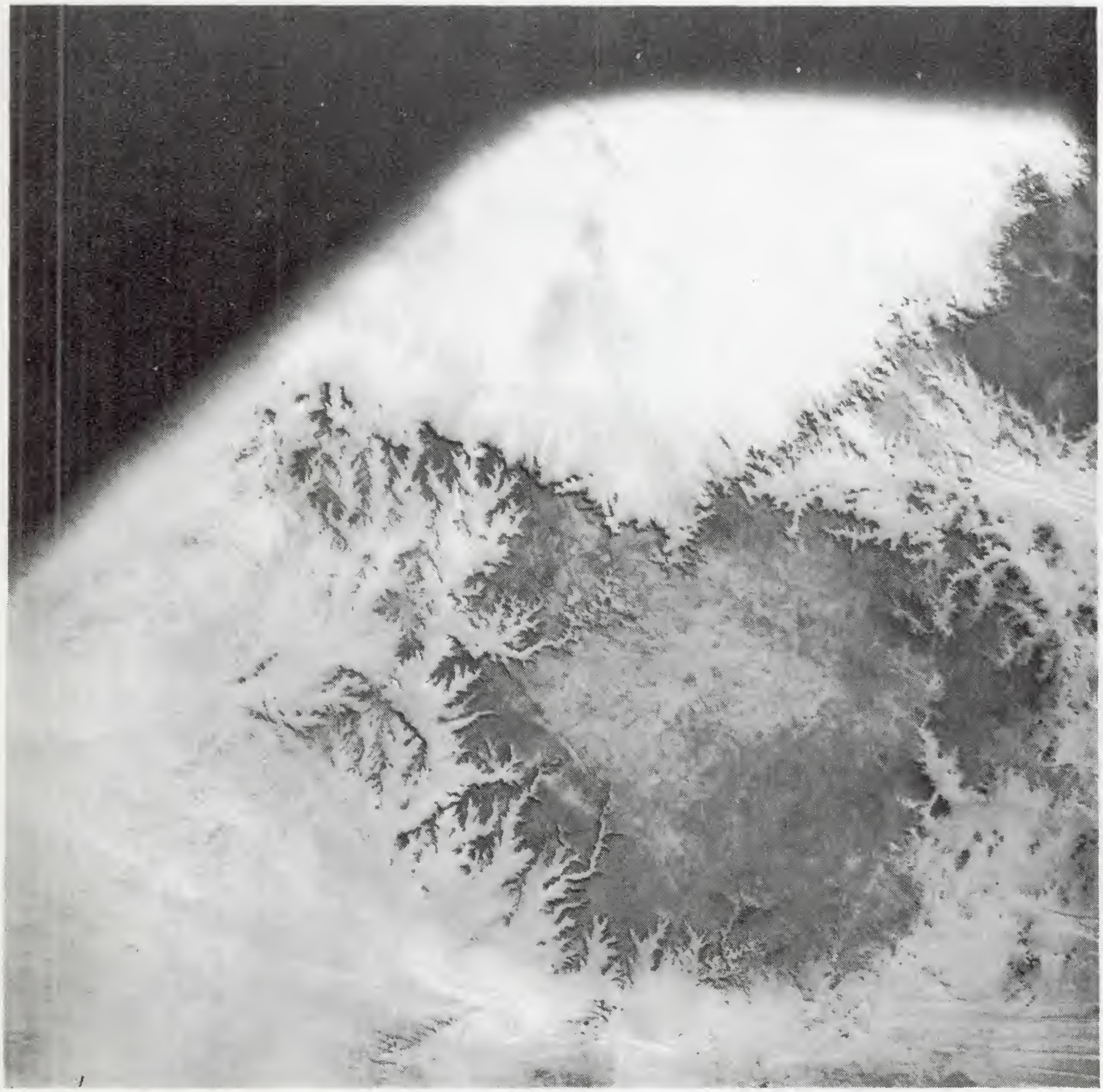

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Figure V-4. - United Arab Republic, Gilf Kebar Plateau.

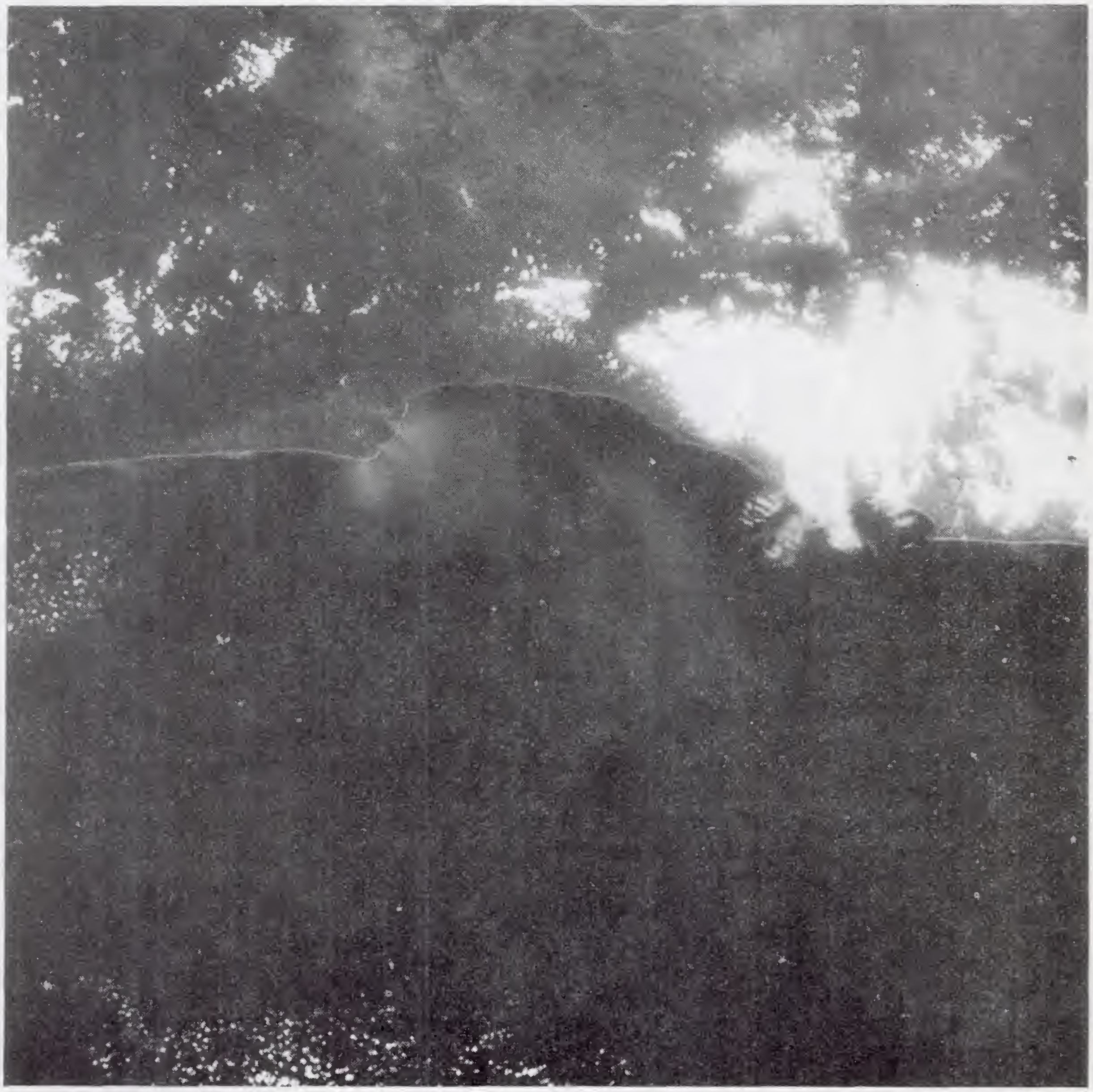

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Figure V-5. - Mexico, Bahia de Petacalco, Balsas River.

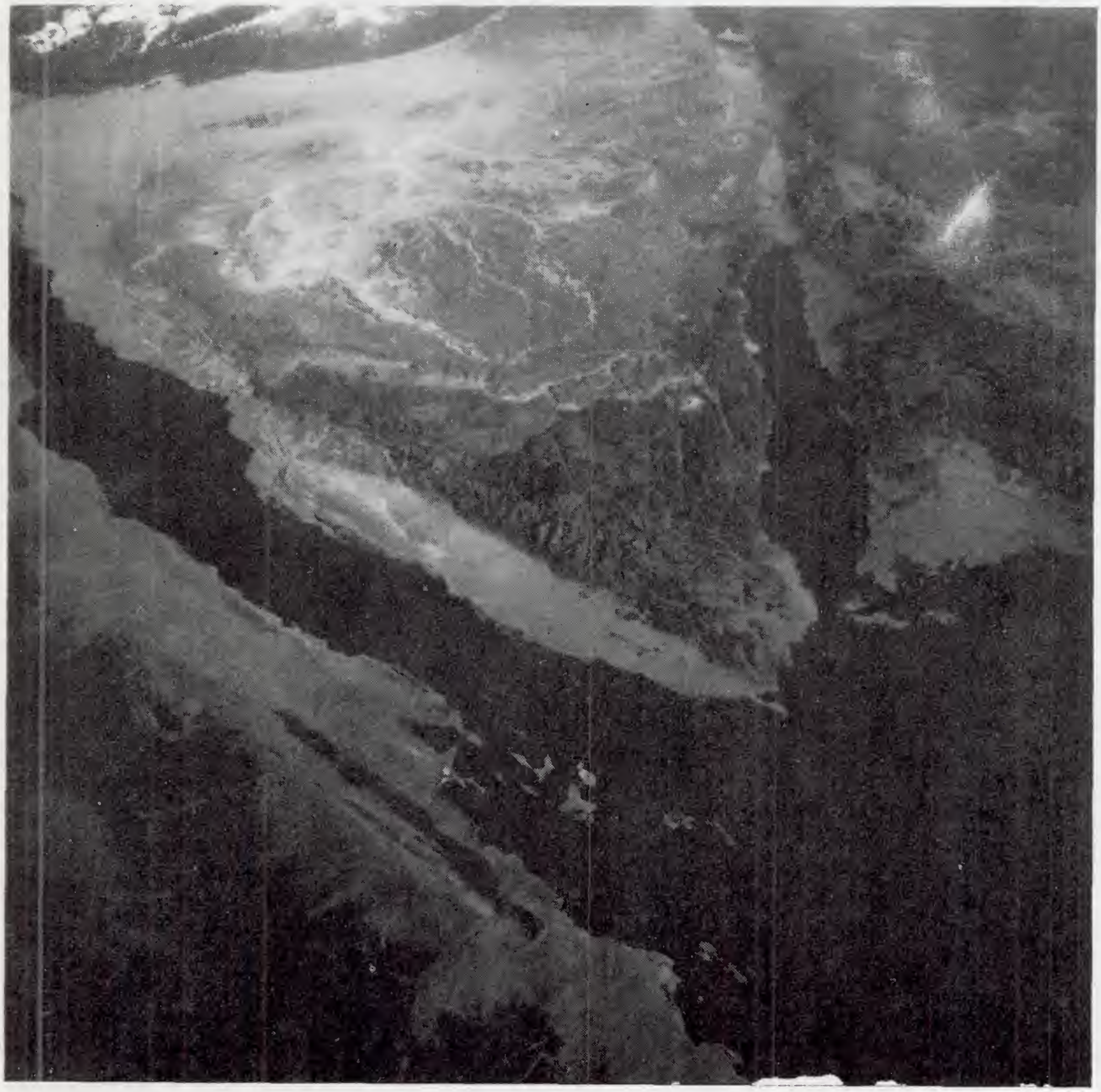

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Figure V-6. - Sinai Peninsula, Gulf of Suez, Gulf of Aqaba.

VI. GEOLOGY

By Malcolm M. Clark
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EVALUATION OF APOLLO 7 PHOTOGRAPHS

This report summarizes the findings after Apollo 7 photographs were viewed on November 14 and 15, 1968. This report includes the following:

1. Image quality evaluation

2. Comparison and relationship of Apollo 7 photography to Gemini and previous Apollo photography

3. Potential uses of the photography in meteorology and the earth resources disciplines

4. Preliminary plans from user agencies, Goddard Space Flight Center, and investigators regarding subsequent exploitation of the photography

5. Recommendations by screening team members for future photographic missions

Many of the Apollo 7 photographs are vivid and of generally excellent quality. Nearly all the views are oblique rather than vertical and show some parts of the earth not previously photographed from space, as well as areas recorded during Gemini missions and the Apollo 6 mission. Among the Apollo 7 photographs are some of exceptional beauty, including new views of the Andes and Himalayas that contain vast amounts of topographic information. This report, however, will deal mainly with photographs of Baja California, because the author recently completed a geologic interpretation of Apollo 6 photographs of that area.

Image quality is generally excellent. Quality of the pictures from type SO-121 film is comparable to that of Apollo 6 photographs. The type 368 film is closer in color balance and contrast to that of the Gemini photographs. For geologic work, Apollo 6 photographs are superior to those from Apollo 7 because they are vertical and have stereographic overlap.

Oblique photographs are beautiful, dramatic, and exciting, but they almost never show surface features better than do vertical photographs of comparable scale and of the same terrain. Oblique photographs tend to obscure or distort the true shape of surface features and are usually not as clear (because of the long light path through the atmosphere) as verticals. The main use of obliques should be to give an introductory view of an area during an explanation or exposition. In the author's experience with many

high- and low-altitude oblique photographs (9-inch format), these generalizations have been verified.

Stereophotography gives obvious benefits demonstrated by Apollo 6 photographs. Even though the low sun angle in Apollo 6 photographs of Baja California serves to emphasize topography, the addition of stereophotography in these photographs removes ambiguity or uncertainty about the amount and kind of topographic expression of many features. The third dimension is an important part of any attempt to define geologic relations from aerial photographs.

In geologic utility, Apollo 7 photographs are in general closer to Gemini photographs than to Apollo 6 photographs. As with the Gemini photographs, Apollo 7 photographs are abundant, oblique, and mostly nonstereographic. Apollo 7 color photographs (except for those from type 368 film) are better than Gemini photographs as a result of the improved definition and color contrast of the SO-121 film. Some examples of comparison with Apollo 6 and Gemini photographs in the Baja California area follow (based on 8- by 8-inch paper enlargements of all photographs).

1. Frame AS7-1795 (sun angle 41°, south source, Apollo 7) and frame AS6-1433 (sun angle 20°, east source, Apollo 6): The scales of these two photographs are nearly the same. Frame AS7-1795 is generally sharper and shows better color contrast, although both photographs appear to be slightly underexposed. Areas in frame AS7-1795 that are defined by circular joints or faults have a distinct color contrast with surrounding areas. However, in frame AS6-1433, the color contrast is nearly indiscernible. The low illumination angle in frame AS6-1433 is a probable reason for its lower color contrast. Visibility of topography (and often structure or lithology) strongly depends on the direction of sunlight, as can be seen on these photographs. The Agua Blanca fault (upper half of both photographs) is more prominent in frame AS7-1795 because illumination is nearly perpendicular to the fault. In frame AS6-1433, the sunrays are nearly parallel to the fault, hence virtually no part of the fault shows as a bright or dark line as is shown in frame AS7-1795. Many north-south lineaments evident on frame AS6-1433 are not evident on frame AS7-1795 (north-south fractures crossing circular feature in the right center of both photographs). In contrast, small east-west lineaments on frame AS7-1795 do not appear on frame AS6-1433 (center of frame AS7-1795).

2. Frame AS7-1629 (sun angle 52°, overlaps the south half of frames AS6-1433, AS6-1434, and AS7-1795): High sun angle results in poor definition of topography in frame AS7-1629 when compared to frames AS6-1433, AS6-1434, or AS7-1795. Color contrast is far better in frame AS7-1629, possibly because of improved exposure in addition to higher sun. One prominent lineation (north-south, east of center of peninsula) is defined by color contrast.

3. Frame AS7-1578 (type 368 film, sun angle 46°, oblique, overlaps all of the other photographs): Color is bluer and of less contrast than in SO-121 photographs (Apollo 6 and 7). Color appears to be closer to that in Gemini frame S-65-34672 (northern Baja California. Even though it is an oblique photograph, the small scale reveals a faint extension of the lineament in frame AS7-1629 into the area of frames AS6-1433 and AS7-1795 on which the lineament is not evident.

Recommendations for characteristics of future photography are as follows: (1) mostly vertical photographs, (2) stereophotographic overlap, (3) SO-121 color, and (4) several low (less than 30°) sun angles over the same target (sun azimuth angles differing by perhaps 45° to 90°).

Orbital photographs are useful in geology because they reveal features of such extent, subtlety, or discontinuity that the features become evident only at the small scales obtainable from orbit. Apollo 7 photographs make a useful addition to the supply.

The photographs described will be used by the author for a brief report on their geologic utility. In addition to Gemini and Apollo 6 photographs, photographs from Apollo 7 will be used by Warren Hamilton in studies of regional techtonics.

VII. GEOLOGY

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PRELIMINARY GEOLOGIC EVALUATION OF THE APOLLO 7 ORBITAL AND SUPPORTING SUBORBITAL PHOTOGRAPHY

Introduction

The Apollo 7 70-mm photography and supporting airborne photography of various formats were briefly examined at MSC on November 14 and 15, 1968, by Malcolm M. Clark and Stephen J. Gawarecki of the Geologic Division, USGS. The purpose of this preliminary screening by USGS and other agency representatives was to provide an input for a preliminary scientific report by MSC personnel on the Apollo 7 photography.

Specific functions for the Science Screening Team were as follows:

1. Image quality evaluation

2. Comparison and relationship of Apollo 7 photography to Gemini and previous Apollo photography

3. Potential uses of the photography in meteorology and the earth resources disciplines

4. Preliminary plans for user agencies, Goddard Space Flight Center, and investigators regarding subsequent exploitation of the photography

5. Recommendations by screening team members for future photographic missions

Orbital Photography

The orbital photography was obtained as an adjunct to investigations primarily oriented to spacecraft procedures. As a result, the astronauts were somewhat hampered in obtaining good results. Of the approximately 500 frames of film types 368 and SO-121 color photography, only about 40 percent were deemed useful for earth science investigations. Very few were verticals, most were low obliques, and many were high obliques. The best photographs for geological purposes were the vertical photographs. Among the other deficiencies noted on the photography were gross underexposure and overexposure, incorrect focus, and lack of stereophotographic coverage.

The type 368 film was superior to type SO-121 film in color contrast and fidelity. The latter film had an overpowering red saturation that masked most color differences in the terrain. An objective comparison of resolution between the two film types was not possible because altitudes were not known and similar areas were not photographed under standard conditions.

The best available comparison of Apollo 7 with Apollo 6 and Gemini IV photography is in the Baja California area where duplicate coverage is found. The higher sun angle on Apollo 7 at this location provides better color contrast and saturation than Apollo 6, but Apollo 6 with its lower sun angle (about 20°) provides better drainage and topographic definition which consequently shows superior lineament definition. The Gemini IV photography of the area was obtained at a high sun angle; but it has slightly less resolution, poor color contrast, and excessive blue coloration. It is of interest that a change in a playa shape has occurred in an area immediately west of the Colorado Delta in the intervening time between the Gemini IV and Apollo 6 photography. This is one advantage of repetitive photographic coverage with the passage of time. This area was not covered by Apollo 7 photography, and a further comparison could not be made.

The additional information on Apollo 7 photographs of the Baja California area has modified some of the preliminary interpretation previously made on Apollo 6 photographs of the geology of the San Pedro Martir Range. Between the two sets of data, a much better interpretation is possible. This points to a requirement for multiple photography of various areas at different sun angles for better interpretation results.

The tentative plans of the USGS for the photography are as follows:

1. Duplicates of Apollo 7 photography should be distributed to the three headquarters at Washington, D. C.; Denver, Colorado; and Menlo Park, California, for inspection by all interested personnel.

2. Specific individuals currently funded by NASA will use photography to supplement other orbital photographs being used in their projects. Included are Roger Morrison, Malcolm Clark, Warren Hamilton, W. Douglas Carter, William Hemphill, and Parke Snavely. Morrison is concerned with soil mapping, Clark with the San Andreas fault and related features, Hamilton with regional tectonics including sea floor spreading, and Snavely with marine geology. Carter and Hemphill have a general interest in geological features in South America and West Pakistan, respectively, where both have worked extensively.

Suborbital Photography

In support of the Apollo 7 mission, the MSC Convair 240A aircraft flew several flight lines in east and west Texas; in Tucson, Arizona, and the outlying vicinity; and in the Colorado River Delta — using 9-inch format Ektachrome and Ektachrome infrared and 70-mm multiband photography with black and white panchromatic film (25A and 58 filters) and color (type SO-121 film with 2A filter and type 2448 aeroneg film transparency). The USGS Water Resources aircraft flew the Tucson area simultaneously at higher altitudes — using type 2448 color film.

The MSC-flown data are for the most part excellent with slight overexposure of color infrared film in the Colorado Delta being the main problem. The black and white panchromatic film was underexposed noticeably. The USGS color photography was very good, but had a slight vignetting problem.

The availability of the suborbital photography will be made known in the USGS, especially to those concerned with the areas covered. It is, however, unfortunate that areas in the western United States were not covered by simultaneous orbital photography.

General Comments

The coverage of foreign areas by Apollo 7 photography was very good, but useful coverage of the United States was scarce. The Apollo 6 data were superior in United States coverage and are currently being studied for regional structure and mineralization relationships.

The comparison between Apollo 6 and 7 photography in the Baja California region shows the value of multiple exposures at different sun angles. Vertical photographs and stereophotographic coverage are required for best results.

Recommendations for future photographic missions are that the specifications mentioned previously should be applied and that synoptic coverage of the entire United States should be obtained with conventional color such as type 368 film or type 2448 aeroneg film and also with color infrared film type 8443.

VIII. GEOLOGY

By Bruno E. Sabels
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Washington, D.C.

IMAGE QUALITY EVALUATION

The best Apollo 7 photographs appear equal or superior to Apollo 6 photographs in image quality. However, there is considerable variation in the image quality as compared to the Apollo 6 coverage, and overall, the image quality is inferior to the automatic Apollo 6 photographs.

COMPARISON AND RELATIONSHIP TO GEMINI AND PREVIOUS APOLLO PHOTOGRAPHS

The Apollo 7 photographs relate more to Gemini than to Apollo 6 photography because of the random picture-taking of targets of opportunity in those missions. The photographs benefit to some extent from oblique orientation, but they also suffer from it. Ideally, both target-of-opportunity photography (Gemini and Apollo 7) and nadir photography with an automated, bracket-mounted camera (Apollo 6) should be considered for future missions using two cameras.

POTENTIAL USES IN EARTH RESOURCES STUDIES

If taken with the proper exposure and under known conditions, both nadir and oblique photography will have unlimited uses in earth resources studies. This is demonstrated by a large number of photographs from both Apollo 6 and Apollo 7 flights.

PRELIMINARY USES OF PHOTOGRAPHY FOR SUBSEQUENT EXPLOITATION

The following are the preliminary uses of photography for subsequent exploitation:

1. Outstanding tectonic features and their application as guides to ore

2. Volcanic features such as craters and lava flows which stand out; impact (meteoritic) versus collapse phenomena

3. Sedimentology in flat-lying areas, erosion, deposition

4. Shorelines and fossil terraces

5. Shipping channels in shallow areas

6. Correction of maps and navigational aids in remote areas of the world

7. Rock types in arid areas; potential development for reservoirs, agriculture, and recreation

8. Testing of geological hypotheses in specific areas

9. Updating of records

10. Improvement of local investigations by use of the "big picture"

RECOMMENDATIONS

The following are the recommendations for photography in future missions:

1. Longer, more extensive planning period

2. More intensive briefing and training of astronauts

3. Photographic coverage both by bracketed and hand-held cameras

4. Simplification of film and filter requests

5. Effort to have clean windows for photography

6. More systematic coverage of areas, independent of astronaut workload

7. Notification of earth resources team members in real-time mission planning in Mission Control

IX. GEOLOGY

By David L. Amsbury
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Houston, Texas

RESEARCH PLANS FOR MISSION 981 PHOTOGRAPHY

Excellent photography of part of the Portrillo volcanic field and the Franklin Mountains, near El Paso, was obtained on Mission 981. Four different color films (Eastman Kodak type 2448, type SO-121, type 8442, and type 8443) were used. Black and white film (type 3400) with a 25A filter and a 58 filter was also used. Apollo 7 photographic coverage of this area is marginal, but the vertical stereophotographic coverage during the Apollo 6 flight is very good. Several different aircraft films will be compared with each other and with the spacecraft photography, to study effects of film type, scale, and resolution on geologic applications. A few days of ground checking probably will be necessary to obtain further information.

X. OCEANOGRAPHY

By I. D. Browne
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Don Ross
Philco-Ford
Palo Alto, California
Jack Paris
Texas A. & M. University
College Station, Texas

Image quality evaluation aspects are as follows:

1. Poor exposure control is evidenced.

2. Window haze degraded image resolution.

3. Graininess and striations of film restrict quality of planned photometric analysis.

4. Preliminary analysis of Apollo 7 photography shows fairly good water penetration.

The following comments compare and relate Apollo 7 photography to that of Gemini and previous Apollo missions.

1. Large number of oblique photographs of Apollo 7 photography are, in general, unfavorable for oceanographic purposes. Apollo 6 photography has more nadir photographs.

2. Improvement of atmospheric haze penetration in Apollo 7 photography exists when compared with Gemini photography.

3. There is a lack of photography over open-ocean areas during the Apollo 7 mission. Apollo 6 photography has more open-ocean coverage.

4. Apollo 7 photography shows better water penetration than Apollo 6 photography.

5. The repetition of photographs over certain targets, such as the Gulf of California, improves the chance of obtaining useful data. This affords the opportunity to view specific areas under different camera angles, different sun angles, and different atmospheric conditions, and provides a record of dynamic feature changes. For example, repetitive coverage of the Gulf of California shows surface patterns in the Gulf enhanced by the glitter of the sun, which were not initially evident in previous nonglint pictures.

Potential uses of the photography in meteorology and the earth resources disciplines are as follows:

1. Study of coastal processes; that is, river outflow, sediment transport and distribution, and wave interference and refraction patterns

2. Indications of subsurface topography and bathymetry

3. Mapping and charting purposes (using nadir photographs)

4. Study of surface roughness differences indicated by sun-glitter patterns; that is, swell-wavelength/direction, sea state, circulatory patterns, and current boundaries

5. Study of air and sea interactions by correlation of low-level cloud patterns to ocean features

6. Possible color differences giving indications of phytoplankton concentrations and upwelled areas, which are of value to fisheries prediction

Preliminary plans from user agencies, Goddard Space Flight Center, and investigators for subsequent exploitation of the photography include the following:

1. Color separation studies for assessment of water depth, enhancement of bottom detail, and discrimination of surface effects (Philco-Ford)

2. Correlation of cloud patterns in the Gulf of Mexico to meteorologic and oceanographic reports from ships (Texas A. & M. University)

3. Correlation of photography to fisheries predictions, Bureau of Commercial Fisheries (BCF)

4. Evaluation of fourier optical analysis for swell and wave refraction studies (University of Michigan, NAVOCEANO)

5. Comparison of Gemini and Apollo photography of same areas to determine effects of illumination conditions, camera angle, and sun angle to aid in defining optimum parameters for oceanographic photography

Screening team members have given the following recommendations for future photographic missions.

1. For future oceanographic space photography experiments to provide more meaningful data, rather than a review, of previous interpretations necessitating

qualifications or assumptions, it is imperative that photographic requirements come from the oceanographic coordinating agency and that experiments should be planned well in advance over specific test sites. The oceanographic community could be organized to provide adequate surface support data to these photographic missions, such as that implemented by the BCF during the Apollo 7 mission. Although it is recognized that all photographic areas cannot have ground truth, the photographs should cover areas which have features of oceanographic interest.

2. Future photographic missions need to be related to such oceanographic problems as water mass differentiation, current detection, bathymetry, sea and swell conditions, and biological phenomena.

3. Existing remote-sensing aircraft should continue to be used in spacecraft photographic missions for concurrent data collection.

4. Correction in graininess and striation of film would be desirable, if these characteristics can be attributed to film processing.

XI. HYDROLOGY

By Daniel G. Anderson
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EVALUATION OF APOLLO 7 PHOTOGRAPHY

The use of the Apollo 7 photographs of earth as applied to water resources (hydrologic) studies is discussed in this section. What may be a problem to the hydrologist may be the essence of another scientist's study. For example, clouds interfere with a view of the surface of the earth, but clouds are important to a meteorologist. Other problems noted on the photographs are sunglint (reflection from the water surface) and obvious errors in exposure. The oblique views are of negligible value for interpretative purposes. The photographs are comparable to the Gemini photographs, probably because hand-held Hasselblad cameras were also used on those missions. The Apollo 7 photographs are a valuable addition to the Earth Resources Program because they fill in several new areas and offer an opportunity for comparison with previous Gemini photographs.

The photographs show synoptic coverage over broad areas that, at a glance, can provide qualitative information about drainage basin characteristics. For example, it may be possible to discriminate between dry and humid climates or between mountainous and relatively flat drainage systems. One can also learn something about how the land is used; for example, urban areas, farms, forests, and barren areas might be identified. Land use is important to the hydrologist because runoff characteristics from these areas may be somewhat different as to quantity and time of flow.

The hydrologist would appreciate having systematic coverage of complete drainage basins similar to that of the Apollo 6 photographs, which were near vertical and were obtained in sequence that enables stereoscopic evaluation. The low-latitude equatorial orbit has limited the photography to very little coverage of the United States. This is an inherent problem of manned satellites.

The angle of the sun is also important to the hydrologist because of solar reflection from the water surface. Several Apollo 7 photographs were adversely affected by this reflection. The reflection can be reduced to a minimum if the photographs are taken in the early morning or late afternoon when the light is still sufficient for proper exposure.

The aircraft photography taken by the USGS at fairly high altitude and by NASA at moderate altitude was of excellent quality and suitable for interpretation and study. Unfortunately, negligible simultaneous space photography is available for the same area; however, previous space photographs may prove to be a useful substitute. The photography of Mission 981 (aircraft) for Test Sites 145 and 146 was of very poor quality, probably because of adverse weather, as was the space photography of Florida. It

would appear to be valuable in the future to have simultaneous photography from space, high altitudes, low altitudes, and ground control at selected sites.

In summary, the Apollo 7 photography will be useful, although many of the frames were of poor quality because of improper exposure, sunglint, oblique views, limited coverage of the United States, and other problems.

XII. HYDROLOGY

By Curtis C. Mason
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Houston, Texas

HYDROLOGY UTILIZATION OF APOLLO 7 PHOTOGRAPHY

The Apollo 7 photography will be useful for three general purposes.

1. General descriptive hydrology of river basins, lakes, irrigated land uses, et cetera

2. Qualitative analysis of bottom topography and sediment transport using the more oblique photographs taken near sunglint areas

3. Semiquantitative measurements of bottom topography and sediment transport using the near-vertical photography in which sunglint is not too close to the area of interest.

The following are examples of photographs useful for general descriptive hydrology:

1. Frame AS7-5-1650, Bahia de Petacalco, Mexico
2. Frame AS7-6-1675, Mouth of Ganges River and Bay of Bengal
3. Frame AS7-6-1680, Hlaing River, Burma
4. Frame AS7-6-1718, Blue and White Nile below Khartoum
5. Frame AS7-7-1758, Lake Tseling Tsho and Nangtsong Tsho, China

The following are examples of photographs useful for qualitative analysis of bottom topography and sediment transport:

1. Frame AS7-6-1675, Mouth of Ganges River
2. Frame AS7-6-1721, Texas Gulf Coast from Beaumont to Corpus Christi
3. Frame AS7-7-1756, East China Sea with Yantze and Shang-Hai, Hang Chow Bay
4. Frame AS7-7-1843, Gulf of Carpentaria, Morio Island and Lemmin Bight River, Australia
5. Frame AS7-8-1896, Great Bahama Bank, Caicas Islands

The following are examples of photographs that could be analyzed for semiquantitative data of sediment content and bottom topography:

1. Frame AS7-5-1650, Bahia de Petacalco, Mexico

2. Frame AS7-6-1723, Georgia Coast

3. Frame AS7-8-1913, Coast of Beria, Mozambique

4. Frame AS7-8-1918, Coast near Mobile, Alabama

5. Frame AS7-11-2025, Gulf of California

By providing a stereographic view of the area, the aircraft photography of the Gulf of California and the mouth of the Colorado River will be useful in distinguishing color differences because of bottom topography and color differences which are due to sediment content.

No measurements were made of image quality; however, the image quality is estimated to be about the same as that of the Gemini photographs. Comparison of the Gemini IV, Apollo 6, and Apollo 7 photography of the mouth of the Colorado River should give an interesting example of the changes in a delta system. Apollo 6 and Apollo 7 photography of the Georgia Coast should give a check on the repeatability of obtaining bottom topography by using negative density techniques; the same is true of the Gulf of California.

RECOMMENDATIONS

Near-vertical photography would be more useful than oblique views for obtaining quantitative data, and some higher resolution photography would aid in determining what optimum space photography resolution for various purposes should be.

XIII. AGRICULTURE

By Victor I. Myers*
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EVALUATION OF APOLLO 7 PHOTOGRAPHY

A brief evaluation of Apollo 7 photography and related aircraft photography was made at the NASA Manned Spacecraft Center on November 14 and 15, 1968. As requested by MSC, items pertaining to the imagery and to future planning are discussed as follows:

1. Image quality: The imagery is of high quality, considering equipment and mission limitations imposed in the planning stages. Detail that can be detected on imagery is generally better in arid regions than in those areas subject to haze, air pollution, and so forth. Resolution, although not determined by the evaluation team, is understood to be approximately 250 feet. Where atmospheric attenuation is negligible, the 250-foot resolution would probably permit certain evaluations shown in Table XIII-I. Where attenuation is a problem, the photography is degraded to the point where many of the possible applications listed in table XIII-I would not be possible. (The attenuation problem can be easily overcome and is discussed in the section on recommendations.)

2. Contrasting illumination: Much of the imagery (that taken near the northern and southernmost limits of the orbits) shows contrasting albedo across each photograph, because of the low seasonal sun angle. Thus, the illumination increases across each photograph from south to north. Also, photograph illumination varies with daily sun angle resulting in brightest areas on the side of the photograph away from the sun. These contrasts in densities on transparencies often result in greater density contrasts across a single frame than those caused by natural reflectance contrasts of vegetation, soils, and other objects. The obvious conclusion here is that photographs should be taken at the time of the highest sun angle.

3. Film-filter combinations: As pointed out in the initial briefing by NASA, the most obvious problem occurred when the astronauts did not use the correct filter. This is a logistics problem which can be overcome by having separate cameras for each film-filter combination. Other films should be included experimentally in the program (see recommendations).

4. Contrasts in albedo: Heavily forested areas have an albedo (ratio of reflected to incoming radiation) of approximately 8 to 10 percent. Agricultural plants and soils

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have an albedo that may vary from 15 to 35 percent. Therefore, correct camera exposures for agricultural areas are usually not adequate for forested areas. Consideration should be given to changing camera exposure over forested areas whenever possible.

COMPARISON AND RELATIONSHIP TO GEMINI AND PREVIOUS APOLLO PHOTOGRAPHY

Where direct comparisons of Apollo 7 imagery can be made with Apollo 6 and Gemini imagery, the quality seems comparable. Differences in quality are generally attributed to uncontrollable conditions. Refer to table XIII-I for potential applications and estimated feasibility of each application at two resolutions (1) that of current Apollo photography, and (2) recommended photography with a resolution of approximately 75 feet.

PRELIMINARY PLANS FOR EXPLOITATION OF PHOTOGRAPHY

Included in the preliminary plans for exploitation of photography are the following studies.

1. Microdensitometry studies will be made with color filters to determine detail that can be extracted from Apollo imagery.

2. Two agricultural research service research watersheds (Tombstone, Arizona, and Washita River basin in Oklahoma) are covered by Apollo imagery. Detailed data on plants and soils have been collected from these watersheds, and these data will be correlated with Apollo imagery.

3. Ground truth from the irrigated Imperial Valley of California will be correlated with Apollo imagery. The ground truth is that information which is related to soils, salinity, and high water tables. These data will be the responsibility of engineers and scientists stationed at the Agricultural Research Service Field Station at Brawley, California.

RECOMMENDATIONS FOR FUTURE MISSIONS

The following recommendations are made for the photography of future missions.

1. To overcome problems of atmospheric attenuation in areas such as the eastern United States, a light yellow filter (No. 12 or slightly lighter) should be used to provide ground detail that is not apparent in many cases with present Apollo photography.

2. Ektachrome infrared photography should be used for vegetative and soils discrimination and for haze penetration.

3. A battery of four cameras should be secured in position, and separate cameras should be used for different film-filter combinations wherever possible.

4. Different film-filter settings should be used for large, relatively uniform areas of contrasting albedo.

5. The huge investment that NASA has made in fundamental earth resources sites, such as Site No. 32, Weslaco, Texas, could be used for space photography ground truth by making a special effort to schedule Apollo coverage of these sites. Also, there are many other experimental research areas where extensive ground data are available, in the areas of Apollo coverage, which could be scheduled for photographic coverage.

6. If scheduling of Apollo photography could be correlated with user groups, local photography could be obtained to enhance the interpretation process.

7. For earth resources studies, cameras with a longer focal length should be used to give improved resolution.

TABLE XIII-I. - AGRICULTURAL FEATURES THAT PROBABLY CAN BE RECOGNIZED FROM SPACE

Application	Resolution	
	250 ft	75 ft
	Recognition (a)	
Snow cover	C	C
Soil survey		
Reconnaissance	C	C
Detailed	N	N
Crop acreage	C[b]	C[c]
Soil salinity		
Reconnaissance	P	C
Detailed	N	N
Disease and insects	C	C
Soil moisture (qualitative)	C	C
Crop production before harvest	C	C
Land use interface		
Timber-grassland	C	C
Grass-brush	C	C
Crop-noncrop	C	C
Brush-timber	C	C
Grass-timber	C	C
Snowline	C	C
Canal (special cases)	Q	C
Irrigation management	Q	C
Locate ground water (special cases)	C	C

[a]Recognition of the features is indicated as follows: C — clearly feasible, P — probably feasible, Q — questionable, N — nonfeasible.

[b]To nearest several acres.

[c]To nearest acre.

XIV. AGRICULTURE AND FORESTRY

By Robert N. Colwell
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EVALUATION OF PHOTOGRAPHY OBTAINED DURING APOLLO 7 MISSION

Evaluation of the Apollo 7 photography is based upon the following:

1. An examination of all color photography obtained on that mission using an Itek viewer

2. An examination of selected frames when projected as lantern slides onto a screen

3. An examination of these same exposures in opaque, 8- by 8-inch positive-print form

4. An examination of contact-size duplicate color transparencies, under magnification, over a light table

The selected frames were mostly from the Tucson area, the Salton Sea area, and the Alice Springs, Australia, area.

1. Image quality evaluation: The best of this Apollo 7 photography is of a quality providing approximately 200-foot ground resolution. Linear features such as roads and streams that are no more than 50 to 75 feet wide frequently can be resolved. However, many frames are either out of focus or degraded by reflections from the spacecraft window. Even under optimum ground lighting conditions, some areas (e.g., Alice Springs, Australia) appear to be badly underexposed, while other areas (e.g., one of the passes over West Africa) are overexposed. Cloud cover obscures several areas of interest to the earth resources investigators; approximately to the same extent as in previous Gemini and Apollo missions. Despite these limitations, some of the Apollo 7 photographs are among the best ever taken from space. Specific examples are as follows:

a. The photograph covering parts of Chile, Bolivia, and Argentina (according to the author's notes, it is frame AS7-4-1593) is the most colorful space photograph ever seen by the author and gives almost perfect color fidelity.

b. The photographs covering the Orinoco River (frame AS7-5-1643) and the Mississippi River to New Orleans area (frames AS7-8-1916, AS7-8-1917, and AS7-1918) give the best penetration, through presumably humid atmosphere, ever seen by the author on any space photography.

2. Comparison and relationship to Gemini and previous Apollo photography: When compared with Apollo 6 photography, the Apollo 7 photography has a less reddish cast; consequently, vegetation differences, which rely on differences in the green (or blue) part of the spectrum, are better seen in Apollo 7 photographs. However, differences between red soils and their surroundings are more pronounced on the Apollo 7 photographs.

More oblique photographs are included in Apollo 7 photography, and some frames show amazing detail even at tremendous distances. For example, frames AS7-11-2022 and AS7-11-2023 show areas far into the San Joaquin Valley of California and far up the Colorado River (much farther north than any previous Gemini or Apollo photographs), and frame AS7-11-2024 shows Willcox Dry Lake and soil boundaries near Tucson with almost unbelievable clarity and color fidelity from a distance of several hundred miles.

3. Potential uses of the photography in the Earth Resources disciplines: Agricultural crops in most of the areas photographed are not photogenic in mid-October when this mission was flown. Nevertheless, field outlines are very clearly seen (e.g., in the Imperial Valley area, frame AS7-11-2023). Agricultural land can scarcely be differentiated from urban and wildland areas in Japan and Okinawa (frames AS7-11-1983 to AS7-11-1985 and AS7-7-1831, respectively) even though only mild overcast conditions existed at the time of photography. However, the most minute field patterns ever seen by the author in moderately humid areas (e.g., Louisiana and Mississippi) are seen on frames AS7-8-1916 and AS7-8-1917.

In the Tucson area it is possible to differentiate brushlands, timberlands, and grasslands fairly well and even to distinguish hardwood from coniferous (very dark blue) timber stands in some areas (e.g., frame AS7-3-1532).

Snowlines are clearly seen in the Himalayas (frames AS7-11-1918 and AS7-11-1982), and the best example of "rain shadow" causing arid regions on one side of a mountain range and dense vegetation on the other (wetter) is seen in frame AS7-11-1979.

4. Preliminary plans to use this photography: Within 1 week after completion of the Apollo 7 mission, it was learned where space photography had been obtained in the Tucson area. On a low-altitude flight (1000 to 2000 feet), approximately 400 35-mm color photographs were taken (consisting of matched pairs of Ektachrome and infrared Ektachrome, using a special two-camera assembly). By this means, ground truth was obtained for a vast area (including the Imperial and Coachella Valleys). Later, much of this area was ground checked, and ground checking is continuing.

This intensive study, mainly in the area south and east of Tucson, will continue during the next several weeks and prior to the SO-65 (Multiband Space Photography Experiment) now scheduled for March or April, 1969.

5. Recommendations for future missions: Astronauts should be requested to follow photography instructions more closely in terms of exposure, filters, focus, and geographic areas to photograph (e.g., adequate photographs of Willcox Dry Lake, Arizona, a prime target, were not obtained). In addition, the excellent cooperation between science screening personnel and NASA MSC Earth Resources personnel should be continued.

XV. RANGE RESOURCES

By Charles E. Poulton
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IMAGE QUALITY EVALUATION

Considering limitations imposed by other objectives of the Apollo 7 mission, the photographic phases can be considered reasonably successful. Many of the photographs are of excellent quality. With the excellent planning and coordination that went into the supporting aircraft program, it was extremely disappointing that it was not possible to obtain near-vertical space photographs over the Tucson Test Site. One high oblique and two low oblique photographs covering part or all of the test site will have some usefulness. Because of the orbital problem on the target date, however, most critical work will be with Apollo 6 and Gemini photographs.

All the supporting RC-8 aircraft photography is outstandingly good and will be extremely useful. The flightcrew and the USGS pilot are to be commended for accurate overflight of designated lines. The quality of the USGS photographs is pleasing and arrangements for USGS were made to do the small-scale photography as requested. This photography will be used in the interpretation and mapping from all available space photographs.

The Hasselblad photography is usable as subsampling photography. Only two deficiencies were noted. Exposure is incorrect on the type 3400 Wratten 58 filter, and it is hoped that the duplicates can be matched to the type 3400 Wratten 25A filter so that color enhancement of the two can be done where needed. Magazines were running backward so that each frame will have to be cut and switched in position.

COMPARISONS TO GEMINI AND APOLLO

The relative merits of the photography is being considered for practical and useful vegetation resources application. The interpretability of soil surface features is also being compared. Since the Apollo 7 prints of the Tucson test area show less red, they are better than Apollo 6 prints for vegetation interpretation. Apollo 6 photography is generally inferior to Gemini IV photography for interpretation of most vegetation features and for many soil surface features. Apollo 7 frames AS7-3-1531 and AS7-3-1532 will be useful for additional comparisons. The high oblique view of frame AS7-11-2024 detracts from its value for mapping; however, it will be useful for evaluation of relationships between the on-line distance and the interpretability of vegetation and related resource features.

POTENTIAL USES

Apollo 7 photography has a number of worthwhile uses in earth resources studies in addition to the use previously mentioned. One of the great needs in the program is to train young university people, potential professors, and potential users in the natural resources community, in the uses, interpretation, and limitations of space photography as a tool for providing information. Several Apollo 7 frames were noted which, if made available to university departments substantially involved in remote sensing, would be extremely useful as teaching aids in courses on remote sensing of earth resources. As universities conduct short courses to update the training of professionals in resource management, availability of these aids would be recognized as a benefit to the Earth Resources Program of NASA.

The type SO-121 film is exceptionally good for mapping of landforms and the frames can be interpreted by a well-trained ecologist for information of value in resource ecology and in land use and development. Apollo 7 photography is superior to Gemini photography in this regard but, because of the lack of stereographic coverage, is decidedly inferior to Apollo 6 photography.

An important benefit from space photography of present resolution and quality is in the development of vegetation and soil resource maps, especially for broad policy and planning. This use is particularly appropriate to the needs of county, state, and national planning commissions and groups. Photography with the technological quality of Apollo 6 could hardly be excelled as a map base upon which to assemble natural resource information. Vegetation resource interpreters can learn to obtain useful information from these photographs, but interpreters need to be well trained in resource ecology and soils. The greatest deficiency in the program may be in the availability of scientists with the field or ground truth experience to do the interpretation.

Another use is broad area, or subregional, stratification as the first step in resource studies. Given a problem and an objective, the study of space photography will permit competent resource people to decide where to concentrate their attention. The selected areas may then be studied by more critical analysis of the space photography, by aerial photograph subsampling, or by ground study to achieve the information objectives. Incorporation of space photography into resource programs could save many scientist man-hours (even years) of time.

An advantage of space photography is the opportunity for sequential coverage. Comparisons of Gemini IV, Apollo 6, and Apollo 7 photography indicate that sequences of photography permit judgments about the relative amount of range resource use over time, as the images indifferent fenced management units change with forage production and utilization. Snowlines detected in Apollo 6 and 7 photographs indicate that water storage and release in hill and mountain regions could be observed by sequential space photography. Stereophotographic coverage and photogrammetric measurement should make possible the development of useful quantitative indices. Space photography would provide the basis for study of whole mountain systems; therefore, a larger number of individually less accurate measurements might actually estimate snow accumulation-and-melt parameters more accurately for large regions than present methods estimate them.

The Apollo 7 mission confirms that space photography has its greatest usefulness when obtained in conjunction with carefully planned aerial photography on a subsampling basis. This is especially true where emphasis is on vegetation and soil resources and on the acquisition of the kinds of information that managers of these resources need. Without adequate aircraft support in well-planned subsampling, the information provided from space photography is restricted to use in broad area planning and policy determination. With aircraft and space photography combined, many of the needs of resource development and management could be met.

PRELIMINARY PLANS FOR EXPLOITATION OF PHOTOGRAPHY

Frame AS7-11-2024 will be studied to try to determine relationships between on-line distance and interpretability of vegetation or related resource features. Because of the higher quality of coverage over the test area, most of the work will concentrate on Apollo 6 and Gemini coverage.

Studies are needed to determine the effect of manipulation of color saturation and balance of all film types on interpretability. Since type SO-121 film loses considerable vegetation and soil detail, yet has many other advantages, it would appear that experiments should be made with its processing and reproduction. These experiments would require direct and very close collaboration between the project and the photographic laboratory at MSC. It is doubted whether the time or funds exist to undertake this experiment in 1969.

The excellent aircraft photography will be extremely useful in interpretation and use of all of the space photography. Prints will be put to use as soon as they can be made available. These aerial photographs are particularly useful (1) in identifying space images, (2) in discovering criteria for separation of similar but ecologically significant Apollo and Gemini images, (3) in explaining patterns and variations in space photography images, (4) in locating vegetation or soil boundaries that are not distinct on space photography, and (5) in determining the patterns and percentages of specific vegetation-soil units or ecosystems that make up the areas circumscribed by a unique space photography image. To the extent that this latter can be achieved, the information acquired from the interpretation of space photography becomes increasingly useful to the on-the-ground manager.

Comparative mapping and interpretation of the USGS photography are expected to be done as soon as copies can be made available. The primary advantage of this work will be to demonstrate some of the advantages of higher resolution obtainable with the KA-58 camera system, as compared to currently available space photography.

RECOMMENDATIONS FOR FUTURE PHOTOGRAPHIC MISSIONS

It is urged that NASA recognize the excellent collaborative effort in exploiting the full potential of the Tucson Test Site. The National Aeronautical and Space Administration should designate this test site for first priority attention on any future missions. Efforts are being coordinated in the area to eliminate duplication in the joint

treatment of all vegetation resources — agricultural, range and forest. Soil resources are being given attention as a component of the ecology of the area. Additional space photography at different seasons of the year would be valuable. Aero Ektachrome infrared film should definitely be included on any missions in late July through early September. Movement is toward involvement of local scientists as informal collaborators on certain phases of the project. Another attempt is necessary to coordinate similar aircraft photography with a vertical overflight of a space photography mission, including the same film and filter combinations in all vehicles.

The author strongly supports the earth resources group in insisting that no deviation from previous instructions be allowed in film exposure during earth resources photography. A further recommendation is a 35-mm Nikon or comparable camera for all photographs of the interior of the space vehicle to overcome a problem on the Apollo 7 mission.

When competent manpower can be assigned, all available aircraft photography in the Tucson Test Site should be examined to study the season-of-photography vegetation-interpretability question. With this background and information that could be assembled from previous work, an experiment should be planned and carried out to determine the optimum season of photography for each of the better film and filter combinations likely to be used in earth resources space photography missions. These experiments could be done with NASA aircraft as background for more effective performance on future earth resources spacecraft missions.

Because of the importance of the Tucson Test Site and achievements from this area, it is hoped that future photographic missions can be achieved with a fixed-mount camera system and that allowances can be made for enough attitude-control propellant to achieve vertical photography ($\pm 5^\circ$) over this target as a minimum.

Time was not available to screen effectively the old photography for scenes having particular value if photographed sequentially. A small interdisciplinary work group could do this screening. A special effort should be made on future missions to make these photographs from as nearly the same position and attitude as is feasible.

XVI. GEOGRAPHY

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COMPARISON OF APOLLO 6 AND 7 PHOTOGRAPHS

The Apollo 7 images include a small number of images of superior quality, but much less than the number of superior images obtained in Apollo 6. In photograph comparison (table XVI-I), the frequency distribution of image qualities is compared over the land areas in Apollo 6 and Apollo 7. The basis for the evaluation is that six levels of quality were discriminated. Quality category 1, the best for excellent photographs, provides that the photographs be near vertical and free of clouds; they have fine color balance, correct exposure, and sharp clear boundaries. Photographs of this quality will be valuable in earth resource studies.

The other categories describe photographs that successively deteriorate in one or more of these characteristics and become progressively more oblique, cloud covered, and degraded in color balance. The photographs have varying degrees of overexposure, underexposure, and fuzzy boundaries. Category 5, for example, is notably oblique, is covered a great deal with clouds, has poor color balance, or is grossly overexposed or underexposed. Such imagery is still usable, but only when an investigation permits acceptance of low-quality photography. Photographs in category 6 are essentially unusable.

A comparison between Apollo 6 imagery across the southern United States and that obtained from Apollo 7 indicates that the essentially vertical photography with overlapping obtained in Apollo 6 enables much more to be done with the Apollo 6 photography than with the nonoverlapping frames of varying obliquity obtained in Apollo 7.

Both stereoscopy and binocular reinforcement are important and useful as Apollo 6 imagery qualities which are not present in Apollo 7 imagery.

While it is not possible quantitatively to document the differences between type SO-121 and SO-368 films, the type SO-121 film has available relatively low-exposure latitude. The type SO-121 film performed superbly well in the Apollo 6 mission when the exposures were predetermined and preset, but performed poorly in Apollo 7.

A comparison indicates that while man does bring certain types of capability to a photographic mission, an automatic system as used in Apollo 6 has, with careful planning, the potential of achieving very satisfactory results. A suitable man-machine balance in future missions could involve "hard-mounting" the cameras to point directly down. The mechanism could be preset so that when the mechanism is manually started, vertical photographs with 60-percent overlap will be obtained until it is manually stopped. The astronaut would use his judgment in taking photographs to prevent film waste near the terminator and to eliminate excessively cloudy regions. Man's ability to make rational judgment would be combined with the advantages of an automatic photographic system.

COMPARISON AND RELATIONSHIP TO GEMINI AND PREVIOUS APOLLO PHOTOGRAPHY

Three examples are given which represent "quick-look" interpretations of selected Apollo 6 images of various areas with high geographic interest. Where possible, direct comparisons are made with comparable Gemini and Apollo 7 imagery with respect to quality, coverage, and scientific data content. All three areas lie within the continental United States and are active test sites in the Earth Resources Aircraft Program.

New Orleans, Louisiana (Frame AS7-8-1918)

Frame AS7-8-1918 is of medium quality and covers the entire New Orleans metropolitan region, as well as a significant portion of southwest Mississippi. Relatively few urban areas were imaged as part of this mission and the New Orleans image is the best of the small group. Frame AS7-8-1918 lacks excellent quality as a result of the low sun angle (22°) and the predominant blue coloration.

Examination of frame AS7-8-1918 under high (X24 to X32) magnification reveals detail within the city. This detail represents a significant advance over the Gemini V photography of Tucson, Arizona, or Gemini XII photography of Houston. Within the city, major open space areas, such as Audubon Park and City Park, can be readily distinguished. Identification of highways includes nearly all elements of the urban freeway system, as well as major elements of the urban arterial system. Identification of these linear and areal elements permits inferences to be made regarding areas of industrial, commercial, and residential land use. Generally, individual blocks and

structures are not resolved, with the exception of a large warehouse covering several blocks in the Algiers area.

The improvement in resolution in frame AS7-8-1918, vis-a-vis previous Gemini photography, is not yet great enough to permit development of a generalized land-use map of adequate accuracy. However, additional resolution improvements may permit this development.

Imperial Valley, California (Frames AS7-11-2023, S64-45747, and S65-45748)

Comparison was made of the Gemini photograph of Imperial Valley portion of Geography Test Site 130 with the Apollo 7 photographs taken 3 years 1-1/2 months later. Ground resolution was considerably poorer on the Apollo photograph than on the Gemini photographs. Field patterns (40 acres and larger) and roads, which are clearly identifiable on the Gemini photographs and which are still clear at X48 magnification, are distinguishable only with difficulty on the Apollo imagery.

The Apollo photographs, however, show the entire irrigated area, including that in Mexico, in a single view. The Gemini photographs, combined, showed only a portion of the Mexican irrigated region. Both the United States-Mexico boundary and the marked variations in land-use patterns across the boundary are as distinctly shown on the Apollo photographs as on the Gemini photographs. A longer segment of the boundary is visible on the Apollo photographs. The ability to determine boundaries and variations in land-use patterns such as these is important in that it indicates that significant cultural differences may readily be delineated on space photographs.

Without additional information, specific land-use types in individual irrigated fields could not be determined solely from the Apollo 7 photographs. However, ground truth was available in the form of land-use observations obtained by a field team from the University of California, Riverside, during the time of the Apollo 7 mission. A sample of the ground-truth data, consisting of crop types in fields ranging in size from 40 to 160 acres, was compared with the Apollo 7 photographs in a strip between Niland and Brawley in the northern portion of the Imperial Valley. (The largest unit squares visible in the Imperial Valley imagery are 160-acre fields.) Land-use types present include cotton, rye, sugar beets, alfalfa, recently plowed ground, and cattle feed lots.

An attempt to match image tones on the Apollo 7 photograph with land-use type, and to locate clearly ground-truth sites on the photograph, was successful only in the case of the largest fields. Even so, between three and five gross land-use categories (urban, field crops, fallow land, unoccupied land, and tree crops) can be identified on the Apollo 7 photograph of the Salton Sea vicinity, including both the Coachella Valley to the north of the Salton Sea, and the Imperial Valley to the south.

Los Angeles and Vicinity, Coastal Southern California (Frames AS7-11-2021 and AS7-11-2022)

Comparison of the Gemini V and Apollo 7 images in the Southern California areas reveals examples of land-use changes in the 3-year period between the two missions.

For example, in the Costa Mesa-Newport Beach area, removal of tree crops (probably citrus) is apparent in an area where urban growth is rapid, and residential and industrial land uses are replacing agricultural land. Farther inland in the Lake Matthews area, the Apollo 7 image indicates an increase rather than a decrease in agricultural land during the 3-year period. The increased area of dark tone representing vegetative cover indicates introduction of new tree crops (in this case, citrus) at higher altitudes on land formerly used for grazing, to replace loss in an urban fringe area. Thus, in these two space photographs, an important dynamic factor in southern California is indicated, namely, the migration of citrus growing from choice lowland sites in the path of urban expansion to less choice upland areas away from the city sprawl. Also in these two views, a regional view of the entire Los Angeles basin and vicinity shows haze and smog patterns in the areal coverage of the smog. Comparison with the Gemini view of the same area may possibly indicate a worsening trend (for example, increased penetration of smog up slope in adjacent mountain ranges, as revealed in the Apollo image, in comparison with the Gemini view taken 3 years earlier at approximately the same season and under similar meteorological conditions).

POTENTIAL USES OF APOLLO 7 PHOTOGRAPHS IN GEOGRAPHY

The two major areas of use are in urban area analysis and in land use and regional planning. Examples include a land-use study of the internal structure of New Orleans, and study in the Dallas-Fort Worth area of the transportation network, and a study in Los Angeles of the distribution of smog and density differences within the smog. In the land-use and regional planning studies, those begun by using previous space photographs will be continued with Apollo 7: the Imperial Valley and the California coast by Leonard Bowden; the Mississippi Valley and Alice Springs, Australia, area by David Simonett; and New Orleans by Duane Marble. Further details are in table XVI-II which shows plans for areas to be studied and the information needed to pursue these studies. The overriding advantage of Apollo 7 photography is that it will enable time-sequential studies to be made in areas for which high-quality coverage has been obtained in earlier missions.

Mission 981 obtained photographs over Fort Worth. This photography will not be directly correlated with the Apollo 7 photograph of that area (which is of marginal quality), but it will be used with the Apollo 6 photographs. Mission 981 in the ordinary aircraft program obtained synchronous aircraft photography which will provide the first opportunity for detailed point-by-point comparisons between spacecraft and aircraft photography in an urban environment (New Orleans).

PRELIMINARY PLANS FOR INVESTIGATORS' STUDIES OF APOLLO PHOTOGRAPHY

Areas that will be studied in detail are given in table XVI-II. The plans for the study include image enhancement through color separation using the Philco-Ford technique and digitizing of imagery to permit quantitative manipulation of the data. Detailed and quantitative (though not necessarily digitially obtained) studies will be carried out on land use, detection of transport networks, small-scale thematic mapping, and change detection.

RECOMMENDATIONS FOR FUTURE MISSIONS

Technical Recommendations

Photography should reflect a deliberate optimization for earth resource analysis.

1. If photography receives a high mission priority, optimization should include mounted rather than hand-held cameras, longer focal length, and 60-percent overlap for specific targets and exposures at or approaching the vertical. Exposure settings should be fixed prior to launch and should remain unchanged thereafter. When practical, the previously described restraints should remain; however, two cameras should be used with the preset exposures two full stops apart.

2. When photographic considerations are secondary, representatives of each discipline (geography, geology, hydrology, agriculture, etc.) should have a preflight opportunity to designate areas to be photographed and to state the priority of photography as the priorities relate to the needs of each discipline. Final priority designations should remain with MSC.

3. Vegetation, its health, distribution, and interfaces are of interest to all earth resource scientists; therefore, it is urgently recommended that Aerial Ektachrome infrared film, in addition to normal color, be used on target areas within the United States unless direct experimentation demonstrates that spaceborne use of this emulsion would be ineffective.

4. A return to conventional Aerial Ektachrome infrared film should be seriously investigated. In preliminary observations it was found that experimentation with other emulsions has not given a notable improvement on Gemini film performance, and in many cases it appears inferior. A systematic comparison of various areas in the United States will be necessary.

5. Film utility increases with improved ground resolution; therefore, it is recommended that a system be used which would produce ground resolutions of approximately 80 feet.

Administrative Recommendations

1. It is recommended that master duplicate transparencies used for public relations be roll processed. However, materials to be used for scientific analysis should be processed on a frame-by-frame basis with processing matched to the investigator's scientific goal.

2. Prior to future mission evaluations, investigators should have multiple copies available of plot sheets showing the outer boundaries of photographs obtained on the latest mission and on all previous space flights so that areas of overlap and contiguity can be noted. As the plot sheets are updated as master indices, they should be reissued and sent to all investigators.

Recommendations of Future Sites and Experiments for Photography

1. Coverage of Puerto Rico both with conventional color film and with color infrared film is recommended. This is the only moist tropical area which is United States territory, with reasonable proximity to the mainland.

2. It is recommended that MSC invite investigators to submit specific experiments relating to new space photography in order to test one or more of the following:

a. The nature and consistency of specific item information gain when using longer focal lengths than the usual Apollo lenses (sites to include, inter alia, Salton Sea, New Orleans, and Dallas-Fort Worth)

b. The nature and consistency of change detection using images of the same area taken on different dates (some photography of this type exists now; however, it was taken of the same areas because of chance circumstances; more pictures of the same area photographed on different dates should be planned)

c. The consistency of boundary and category delineation from photographs taken on successive flights (some photography of this type exists now; however, it was taken of the same areas because of chance circumstances; more pictures of the same area photographed on different dates should be planned)

d. The effect of changing sun angles on information retrieval for areas near the spacecraft high-latitude recurvature zone

e. The utility of synchronous normal color and color infrared photography

3. It is recommended that in future missions all investigators be notified beforehand of the areas planned for photography.

4. In future missions, the areas of planned MSC aircraft flights should be coordinated with investigators so that ground truth collection, aircraft flight lines, and spacecraft data may be integrated.

TABLE XVI-I. - COMPARISON OF APOLLO 6 AND 7 PHOTOGRAPHS

[Excluding blank negatives and water and spacecraft interior pictures]

Photograph quality	No. of frames	Percent of total	Apollo 6		Apollo 7	
			No. of frames (a)	Percent of total	No. of frames	Percent of total
1. Excellent	16	12	16	17	5	2
2. Good	39	28	39	43	42	16
3. Moderate	15	11	15	16	51	15
4. Poor	14	10	14	15	57	17
5. Very poor	53	39	9	10	97	29
6. Virtually unusable	--	--	--	--	71	21
	137	--	91	--	332	--

[a]Less frames near terminator.

TABLE XVI-II. - PRELIMINARY PLANS FOR SUBSEQUENT EXPLOITATION

OF APOLLO 7 PHOTOGRAPHY

Place and frame	Investigator				
	Aspect to be investigated (a)				
	1	2	3	4	5
New Orleans					
Frame AS7-8-1917	Marble Mallon	Marble Mallon	Marble Mallon	Marble Mallon	Marble Mallon
California Coast					
Frame S64-45631		Bowden Alexander			
Frame AS7-11-2021		Bowden Alexander			
Mississippi Valley					
Frame AS7-8-1916			Simonett	Simonett	Simonett
Salton Sea					
Frame AS7-11-2023	Bowden Alexander		Bowden Alexander Marble	Marble	Marble Alexander Bowden
Frame S65-45748	Bowden Alexander		Marble	Marble	Marble Alexander Bowden
Houston					
Frame AS7-7-1872			Marble	Marble	Marble
Frame S66-63034			Marble	Marble	Marble
Dallas-Fort Worth					
Frame AS6-2-1462	Simonett	Simonett Marble	Simonett Wilson Marble	Simonett Wilson Marble	Simonett Wilson Marble
Frame AS7-7-1863	Simonett		Simonett		
Midland-Odessa					
Frame AS7-11-2032	Simonett		Simonett		Simonett
Frame AS6-2-1454	Simonett		Simonett		Simonett
Chile-Argentina					
Frame AS7-3-1539	Bowden		Bowden Wilson		
Alice Springs, Australia					
Frame S65-45568	Simonett	Simonett	Simonett	Simonett	Simonett
Frame AS7-7-1859			Simonett	Simonett	Simonett
Willcox Dry Lake					
Frame AS6-2-1442	Bowden Peplies			Bowden Peplies	
Frame S65-4575	Bowden Peplies			Bowden Peplies	
Australia Cape York Peninsula					
Frame AS7-8-1902			Simonett	Simonett	Simonett
Frame AS7-8-1845			Simonett	Simonett	Simonett

[a]The following are the aspects:

Aspect	Process
1	Philco-Ford density separation
2	Isodensity digitizing and analog plot (slit widths to be individually specified; filters to be specified)
3	Color transparencies 8 by 8 inches with the color balance adjusted to achieve a truer tone and eliminate excessive blueness (details of manipulation to be specified by the investigator)
4	Contact transparencies with truer color balance (details to be specified by the investigator)
5	Truer color balance paper prints by various magnifications for portions of frames (details to be specified by the investigator)

XVII. CARTOGRAPHY

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CARTOGRAPHIC COMMENTS

Image quality evaluation for the scale of the photography image quality varies from very poor to excellent; image quality appears to be a random variable. The type SO-121 film appears to show superior haze penetration.

In comparison with photographs from Gemini and Apollo 6, the Apollo 7 photographs are similar to Gemini photographs with respect to excessive tilts, lack of stereographic overlap, poor exposures, and poor focus conditions. For cartographic application, the Apollo 7 photographs are poorer than the Apollo 6 photographs because of the lack of stereographic coverage, excessive tilts, and a large number of out-of-focus shots.

The additional coverage afforded by Apollo 7 is of some value for photomosaic preparation, including extending the coverage of photomosaics and photomaps compiled from Gemini and Apollo 6 photography. Coverage over unmapped areas is valuable to persons interested in these areas.

Preliminary plans for exploitation will make use of exposures which are amenable to rectification and enlargement. Photographs of areas of interest to investigators in earth resources disciplines will be compiled as photomaps on an experimental basis. Areas which are covered by either Gemini or Apollo 6 and Apollo 7 photography will be studied to determine the value of the photography as a means of detecting changes in map-worthy features. Further studies will be made of the resolution of the photography, using conventional aerial photography for comparison.

RECOMMENDATIONS

For cartographic applications, it is recommended that a higher resolution and longer focal-length camera with metric calibration data be used. The camera should have at least four fiducial marks. A positive means of holding the film flat during exposure should be provided. Furthermore, the camera should be calibrated on a state-of-the-art camera calibrator before the flight and immediately after the flight is completed.

The camera should always be held in a fixed bracket and tilted so that the exposures are within 3° of vertical. The exposures should be overlapped approximately

55 percent so that compilation of detail can be effected by using conventional stereo-plotters.

Variables such as exposure conditions and film-filter combinations should be controlled automatically so a minimum of handling is required in space. Data regarding camera-operating conditions should be automatically recorded. Future missions should include color infrared film, as well as type SO-121 film for earth resources studies.

XVIII. METEOROLOGY

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THE APOLLO 7 WEATHER PHOTOGRAPHY EXPERIMENT (S006)

Introduction

Because of general interest and increasing use of operational weather satellite products in meteorology and related fields, attention has been given to the detailed color views of cloud systems and other phenomena which can be obtained from manned orbital space flights. As in the Gemini Program, the experimenters in the weather photography effort collected ideas from many researchers in meteorology and related environmental sciences to ascertain targets to be photographed. A list of 27 basic categories, with a number of subcategories, was made available as background information for the crew. Selected items likely to be encountered during the Apollo 7 mission were discussed with the crew in September 1968. During the mission, the locations of selected interesting phenomena (notably tropical storms) were relayed to the flightcrew. It was recognized that many of the phenomena of which views are desired would not occur in a specific mission period. Limitations in the amount of film, in the time available for photographic activities, and in fuel for orienting the spacecraft into proper position would preclude getting pictures of many of the interesting meteorological scenes and other scenes related to other sciences.

A number of significant pictures were obtained which provide new insight into various atmospheric and oceanographic phenomena. Many of the views will serve as illustrative material for teaching — in general meteorology and in training weather forecasters in the operational use of meteorological satellite pictures.

Results

Of the approximately 500 70-mm color pictures obtained by the Apollo 7 crew, approximately 300 photographs show clouds or other items of interest in meteorology, and approximately 80 photographs contained features of interest (table XVIII-I) in oceanography.

Tropical storms are among the meteorological features for which good color photographs are desired by a number of meteorological groups; excellent views of Hurricane Gladys and Typhoon Gloria were obtained. Figure XVIII-1 shows one of a series of views taken of Hurricane Gladys at 15:31 G. m. t., October 17, 1968. This photograph and the others taken on this pass are the best color photographs of a tropical storm circulation taken from space. Views of tropical storms taken during other missions typically included only part of the storm area or were dominated by a high

cirrus cloud deck. In this view, when the storm was just west of central Florida, the spiral bands of shower activity (which are characteristic of tropical storms) are easy to detect. There is a typical, although relatively small deck of cirrus over the storm, but the circular cap near the eye is unusual. Such clouds are normally formed when the rising air from a very active cumulonimbus cloud is retarded by the stable air above the tropopause and, in the absence of wind shear, spreads out in all directions. Sometimes the outflow appears to have a wavelike motion, creating concentric rings of more prominent clouds.

For comparison, figure XVIII-2 shows the ESSA-7 weather-satellite picture of Hurricane Gladys. The hurricane is shown about 4 hours later in figure XVIII-1. Operational satellite pictures are used routinely to show the locations and gross features of meteorological systems. The color photograph enables the meteorologist to ascertain much more accurately the types of clouds involved.

Figure XVIII-3, taken at 00:26 G. m. t., October 20, 1968, is one of the best views from space of the eye of a tropical storm, Typhoon Gloria. For comparison, the ESSA-7 view taken about 5 hours later (fig. XVIII-4) shows the large, well-formed eye of the storm. During the last few days of the mission, the storm made the seas uncomfortably rough at tracking ship Mercury and caused the aiming points for potential landings in the western Pacific Ocean to be relocated.

The effects of islands on the cloud distribution and on the wind field as shown by cloud patterns are well illustrated by photographs having the scale and quality of those obtained during the Gemini and Apollo 7 missions. One example is the picture of Oahu, Hawaii (fig. XVIII-5). Here, the trade-wind flow from the east has apparently been split by the island, resulting in convergence and cloud lines on the lee side of the island.

Oceanographic surface features have been revealed more clearly in the photographs from this space flight than in any of the preceding manned flights. Phenomena such as eddies, slicks, swells, and other lines are indicators of surface water motion. One of the most remarkable photographs from space is in figure XVIII-6. This view, featuring the Indonesian Islands of Biak and Supiori, shows a faint but definite pattern of ocean waves — more properly, swells — north of the islands. The wave spacing is approximately 1000 feet. The surfline appears brighter and wider on the northern reefs and beaches than on the southern coast. It is probable that the swells originated from the winds of Typhoon Gloria, which for several days was located approximately 1200 to 1500 miles to the north.

The various patterns on the sea surface are especially evident when the reflection of the sun is photographed. Sediment discharged from rivers into the sea discolors the water, making it possible to see the movement of coastal waters by currents. A careful study and interpretation of these phenomena can produce information on wind direction, as shown by swell alinement on areas of converging and diverging surface water which relates to sea-surface temperatures, and on slicks which frequently show the presence of internal waves. Marine meteorology is strongly influenced by the interaction between the air and the sea. Sunglint photographs showing large areas of the sea surface can be a useful tool in studying marine weather.

In general, the color and exposure quality of the pictures on type SO-368 film was excellent. The crew encountered some problems in exposing the type SO-121 film, and many frames are underexposed, magenta in color, or overexposed. The need to change film magazines, filters, and exposure settings hurriedly when a target came into view probably accounts for the improper exposure of many frames. When properly exposed, the type SO-121 film exhibits a magenta color balance in the highlights. Image sharpness ranged from fair to excellent on both films, with steadiness in holding the camera a probable factor in those frames tending to contain blurred images. Swells on the sea surface were resolved on both films. Most of the photographs were taken over the following geographic areas: southern United States, northern Mexico, northeastern Africa, southern and southeastern Asia, western and northern Australia, and Hawaiian Islands area. One magazine of type SO-121 film contained enough film for approximately 145 exposures; the other magazines each held approximately 65 exposures. From a total of approximately 500 frames, 300 frames may be of use in meteorology, 165 in geology, and 80 in oceanography.

The Apollo 7 photographic frames used in this experiment are contained in the following list.

APOLLO 7 PHOTOGRAPHIC FRAMES

October 11 to 22, 1968

Frame	Comments
Magazine M	
AS7-3-1529	Sediment patterns in Gulf of California. Compare with Gemini IV photography.
AS7-3-1541 and AS7-3-1542	Cloud streets along Gulf Coast. Investigate low-level wind profile.
AS7-3-1544 to AS7-3-1546	Cloud streets and thunderstorms over Florida. Investigate wind profile.
AS7-3-1548	Investigate origin of convective and cirrostratus clouds.
AS7-3-1554	Example of penetrative convection. What is wind structure near tropopause?
AS7-3-1555 and AS7-3-1556	Von Kármán eddy. What is location and cause?
Magazine N	
AS7-4-1590 and AS7-4-1591	Tuamoto Atolls. What is reason for cumulus cloud lines? (Inertia circles)

Frame	Comments
AS7-4-1592	Cellular structure in stratocumulus over Arabian Sea south of Pakistan.
AS7-4-1593	Climatic boundary in upper-right corner. Why are cumulus clouds along the boundary?
AS7-4-1594 and AS7-4-1595	Study sediment patterns along coast and in lagoons. Why is structure in clouds perpendicular to the coastline?
AS7-4-1604	Determine altitude of snowline using topographic maps. What are dark spots in snow?
AS7-4-1607	Investigate eddies in lee of cape on Biak. Measure swell wavelength. Determine surface wind direction and speed. Absence of swells to left of island. Wave diffraction patterns at end of island. Heavier surf on right of island.
AS7-4-1608	What are lines in water in sunglint area? Measure distance between "slick" lines.
AS7-4-1611	Study sediment patterns along coast.
Magazine O	
AS7-6-1691	Estimate thickness and investigate double red band in limb at edge and center.
AS7-6-1695 and AS7-6-1696	Determine wind direction and speed at cirrus level and reason for cross-banding.
AS7-6-1705	Determine coastal current direction from sand spits.
AS7-6-1713	Why is stratocumulus confined to north side of Canary Islands?
AS7-6-1714	Are bands and lines in stratocumulus island-induced?
AS7-6-1720	Study sediment patterns along coast. Associate wind profile with cumulus cloud streets and bands in higher clouds at right angles.
AS7-6-1725 and AS7-6-1726	Relate cumulus cloud lines to low-level winds. Is convective cloudiness associated with Gulf Stream?
AS7-6-1729 and AS7-6-1730	Are convective clouds and cirrus part of the Intertropical Convergence Zone?

Frame	Comments
AS7-6-1731	Is "hook" in stratocumulus caused by cape on Baja California's west coast?
AS7-6-1734	What are features along edge of underwater bank?
AS7-6-1735	Is wind direction to left as towers of cumulus are leaning?
Magazine P	
AS7-11-1979 to AS7-11-1982	Determine altitude of snowline by using topographic maps. Compare snow coverage with past Gemini photographs.
AS7-11-1983	Note increase in width of cloud band at photograph center.
AS7-11-1985	Measure wavelength of bands in clouds.
AS7-11-1986	Do radial lines in cellular clouds represent flow directions? Closed Benárd cells?
AS7-11-1987	Determine cause of cloud line at right.
AS7-11-1989	Compare dune structure with possible Gemini photographs of same area.
AS7-11-1990	Why is convective cloud band along east coast of Oman?
AS7-11-1992	Compare with possible MA-9 photograph of same area and note any changes.
AS7-11-1996 and AS7-11-1997	Examine open-cell patterns; estimate diameters. What could be causing thunderstorms at left?
AS7-11-2002	Study sediment patterns in water.
AS7-11-2005	Study lines in structure of stratocumulus clouds. Note vortex.
AS7-11-2012	Determine why Canary Islands are creating bands in stratocumulus. Note slick line extending from island to line in clouds near coast.
AS7-11-2013	Determine coastal wind structure and current direction and associate with Cape Rhir eddy. Note lines in the stratocumulus.
AS7-11-2016	Is cooler sea surface suppressing cumulus development off west coast of Florida?

Frame	Comments
AS7-11-2017 and AS7-11-2018	Note cumulus congestus near Florida coast. Compare cloud field with wind profile.
AS7-11-2019 to AS7-11-2022	Note leewave pattern in cirrus east of Sierra Nevada. Study smog patterns over Los Angeles. Relate stratocumulus clouds offshore to wind field. Is cirrus along front? Note eddy near Catalina Island.
AS7-11-2023 to AS7-11-2027	Study ocean surface features in sunglint areas on Gulf of California. Note eddies, island effects, slicks.
AS7-11-2031	What is generating cirrus clouds?
AS7-11-2033 to AS7-11-2039	Compare low-level wind structure with cloud lines. Note features in water.
Magazine Q	
AS7-5-1620	Estimate crest-to-crest distance of sand dunes.
AS7-5-1624	Study sediment patterns off mouth of Euphrates River. Note eddies in sunglint pattern at right.
AS7-5-1626	Explain large gradients in sediment pattern. Does upwelling exist along coast?
AS7-5-1628	Is blue arc in sea near Isla Cedro an artifact?
AS7-5-1631	What is relationship of cumulus cloud position off San Lorenzo Island to change in sea reflectivity? Note eddies.
AS7-5-1632	Note numerous eddies in water.
AS7-5-1634 to AS7-5-1636	Notice eddies and lines in coastal water.
AS7-5-1644	Sharp edge on stratus, shadow, and sea surface feature.
AS7-5-1647	What is low-level wind? Convergence line in lee of island?
AS7-5-1649 and AS7-5-1650	Note river effluent pattern.
AS7-5-1656	Is pattern in sand dunes? If so, how is it formed?
AS7-5-1660	Is dust blowing at the right side of the photograph? Check weather observations. What is "star"?

Frame	Comments
AS7-5-1665	Has island at upper right created the long cloud street? Note forking in streets.
AS7-5-1666	Note crater near corner.
<u>Magazine R</u>	
AS7-8-1880 and AS7-8-1881	Compare underwater features near Shark Bay with Gemini photographs.
AS7-8-1885 and AS7-8-1886	What created the two long cloud lines? Are billow clouds down-wind of the line? Note perpendicular structure in cloud bands. Note billows in the cirrus at lower right.
AS7-8-1887	Is blue haze over water from smoke?
AS7-8-1888	Is cirrus near jet stream?
AS7-8-1891 and AS7-8-1892	Note billows in the cirrostratus and the convection cell.
AS7-8-1893	What are white lines off Cape Kennedy?
AS7-8-1894	What are dark features in water off Cuba? Look up surface winds.
AS7-8-1895	Note features along edge of bank.
AS7-8-1898	What is white streak on sea?
AS7-8-1900	Cross-banding in smoke from fires?
AS7-8-1908	Examine gridlike rows of cumulus off Australian coast.
AS7-8-1911	Note billow clouds in lower right.
AS7-8-1914	Note curvature to smoke plumes. Identify with wind profile.
AS7-8-1916	Note smoke plumes and fog (?) patches.
AS7-8-1918	Note sediment patterns in Mobile Bay and along coast. Smoke plumes west of bay appear to have a westerly bend.
AS7-8-1920	Check winds along coast to determine whether Natal has sea breeze and north coast does not.
AS7-8-1922	Are clouds part of a cold frontal zone?

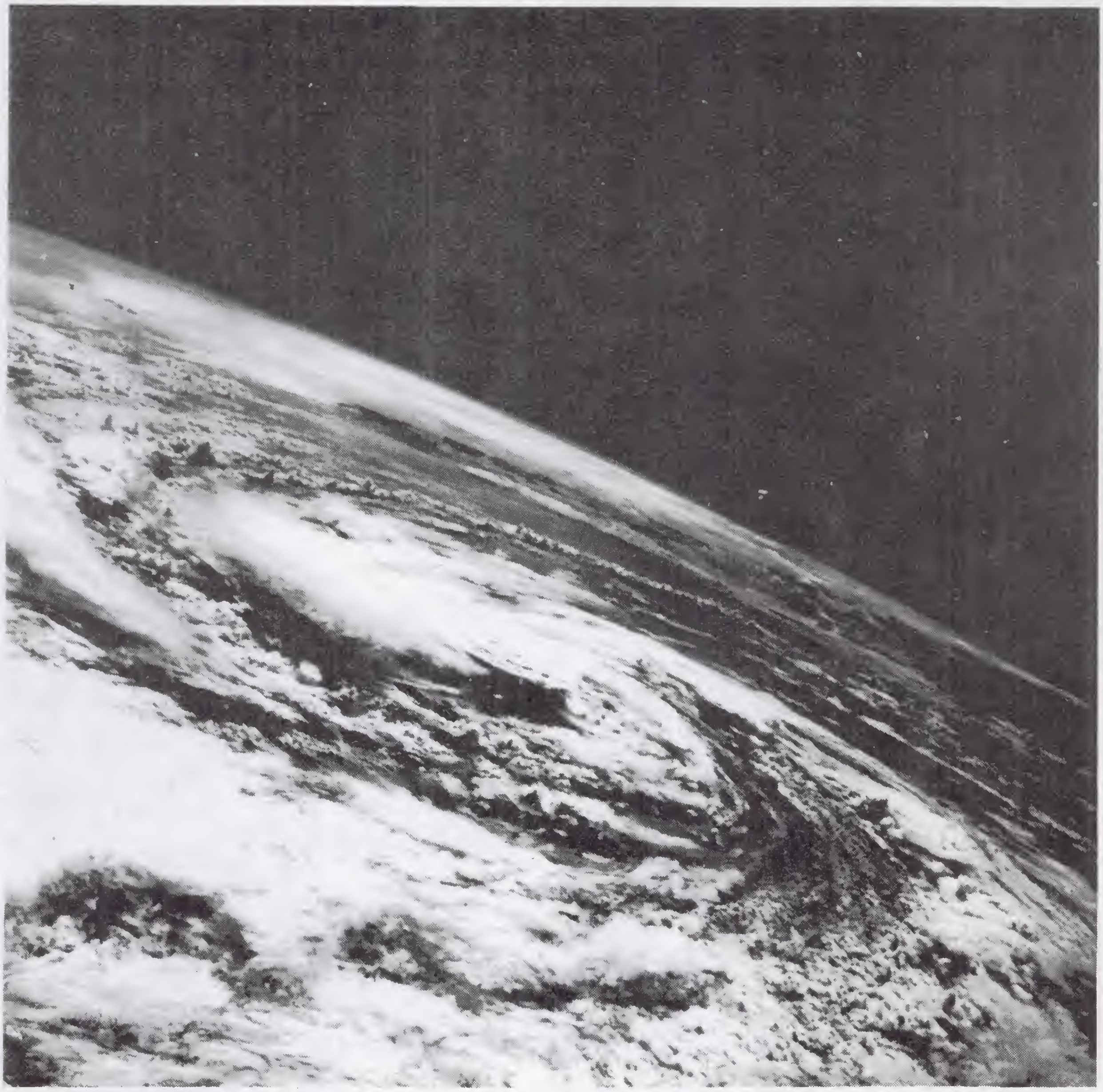
Frame	Comments
AS7-8-1923	Note suppression of cumulus clouds under the cirrus. Why are there other breaks in the cumulus field?
AS7-8-1924	Good example of sea breeze effect in cloud pattern.
AS7-8-1930	Eye of Typhoon Gloria. Study alinement of cirrus for upper-level flow. Determine position of wall-cloud. Measure eye diameter.
AS7-8-1932	Compare water level in Lake Chad with past Gemini photographs.
AS7-8-1933	Measure smoke plume length coming from Port St. Joe.
AS7-8-1935 and AS7-8-1936	Good examples of convective clouds over the sea.
AS7-8-1937	Determine wind direction at surface and distance of eddy from Guadalupe.
AS7-8-1943	Study sediment pattern along the coast.
Magazine S	
AS7-7-1738 to AS7-7-1747	Compare with cloud photographs from ESSA and(ATS). Determine which cloud forms are island-induced and why: southwest of Oahu, Maui, Nihau. What is patchy, blue haze between Maui and Hawaii? Study orographic clouds on Hawaii.
AS7-7-1750 to AS7-7-1756	Compare sediment patterns at Amazon River mouth with past Gemini photographs for changes.
AS7-7-1759	Look up upper-air flow to determine cloud alinement. Note series of billowlike clouds near horizon.
AS7-7-1764	Note directional changes in billows. Good examples. Measure wavelength.
AS7-7-1772 to AS7-7-1774	Note water patterns in sunglint. How well are coral reefs charted?
AS7-7-1777 and AS7-7-1778	Note circulation in water off cape near Mukalla.

Frame	Comments
AS7-7-1779	Does current from northeast form the eddy between Socotra and The Brothers? Study slicks, lines, wave orientation. What is white line in sea south of Socotra? Compare with Gemini photograph of Socotra.
AS7-7-1782	Compare island and reefs with charts.
AS7-7-1800	Examine coastal current and sediment pattern off Matagorda Bay. Compare with previous photographs.
AS7-7-1801 to AS7-7-1803	Look up reason for heavy cirrostratus over Gulf of Mexico.
AS7-7-1808	Determine whether or not white patches beyond mountains are fog.
AS7-7-1811	Is haziness along coast caused by very thin cirrus or window residue?
AS7-7-1821	Surface must be very calm because clouds are reflected on sea.
AS7-7-1825	Good example of cirrus being produced by convection.
AS7-7-1846 and AS7-7-1847	Explain the long, dark line near the horizon.
AS7-7-1863	Note smoke plumes.
AS7-7-1868	Why are thunderstorms along the shoreline?
AS7-7-1874	Note sharp edge and shadow made by cirrus at outer edge of hurricane.
AS7-7-1875 to AS7-7-1878	Determine center of circulation of hurricane Gladys. Compare with ESSA photographs. Center is on line between New Orleans and Key West.

TABLE XVIII-I. - SUMMARY OF PHENOMENA PHOTOGRAPHED

[The phenomena listed are considered worthy of further study]

Category	Phenomena	Location
Weather systems	Tropical storms	Florida, Pacific Ocean
	Thunderstorms	United States, southeast Asia, South America, United States
	Frontal zones	United States
	Cellular stratocumulus	Eastern Pacific Ocean, Eastern Atlantic Ocean
Winds	Cumulus cloud lines	United States
	Sea swells	Biak, Socotra
	Sea breeze zone	United States, Brazil
	Cirrus anvil clouds	United States, Africa, Australia
	Jetstream cirrus clouds	Africa, Australia
	Billow clouds	United States
	Smoke plumes	Australia, southern United States, Hawaii
	Sand dune alinement	Africa, Asia
	Surf zone	Coasts, islands
Ocean surface	Vortices	Biak, Socotra, Persian Gulf, Gulf of California
	Sea swells	Biak, Socotra
	Slicks and lines	Gulf of California, Persian Gulf
Underwater zones	Ocean-bottom configuration	Australian reefs, Pacific atolls, Bahama Bands, Cuba
	Turbid water patterns	Coastlines, gulfs
Landform effect	Mountain lee clouds	Sierra Nevada, Hawaiian Islands, Canary Islands
	Eddy clouds	California coast, Cape Rhir
Climatic zones	Snow line and cover	Asian mountains
	Vegetation boundary	Africa, mountain slopes
Hydrology	Snow cover	Asian mountains
	Streams and lakes	Lake Chad, United States



AS7-7-1877

Figure XVIII-1. - Hurricane Gladys, centered off the west coast of Florida, at 15:31 G. m. t., October 17, 1968.

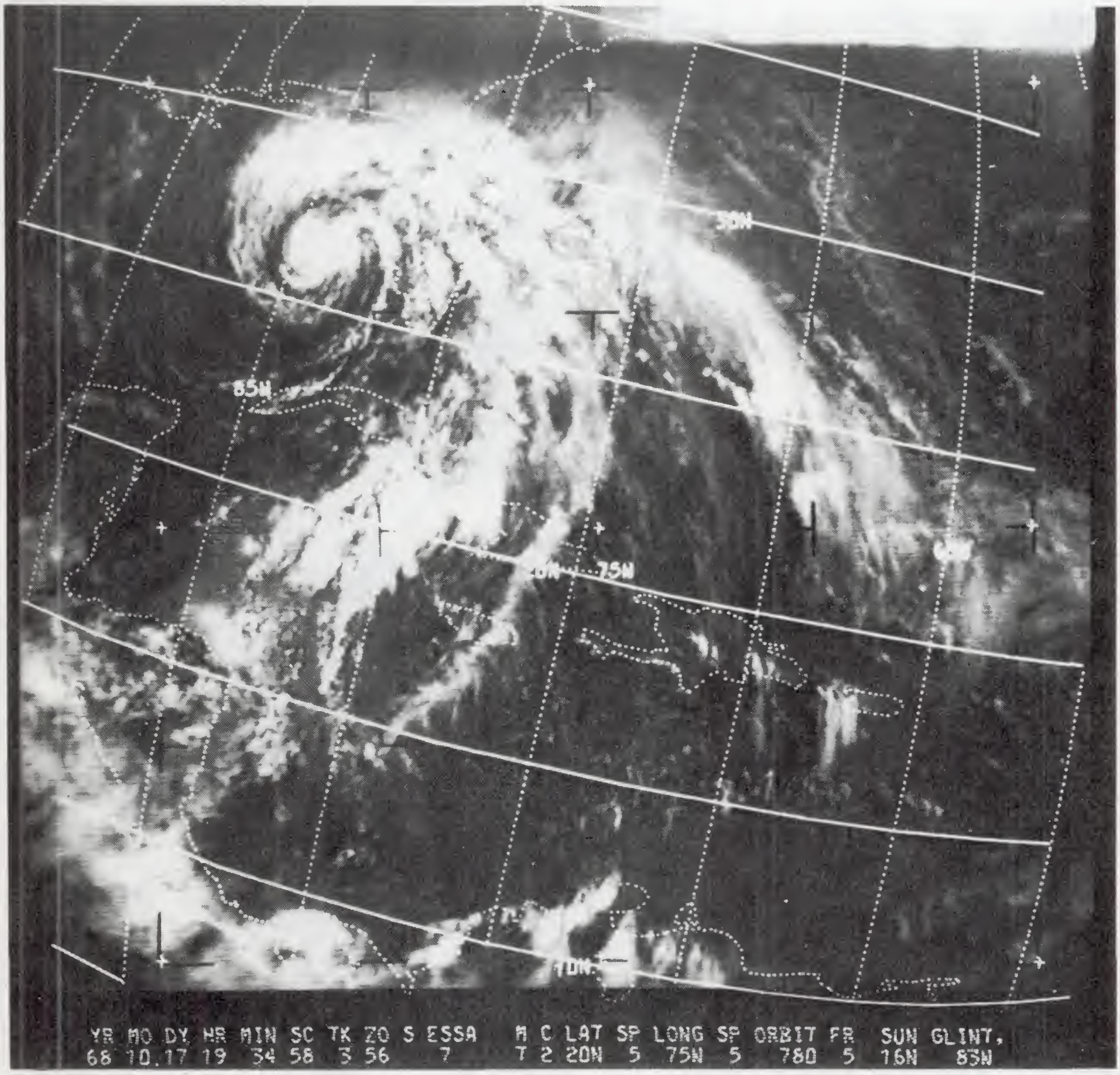
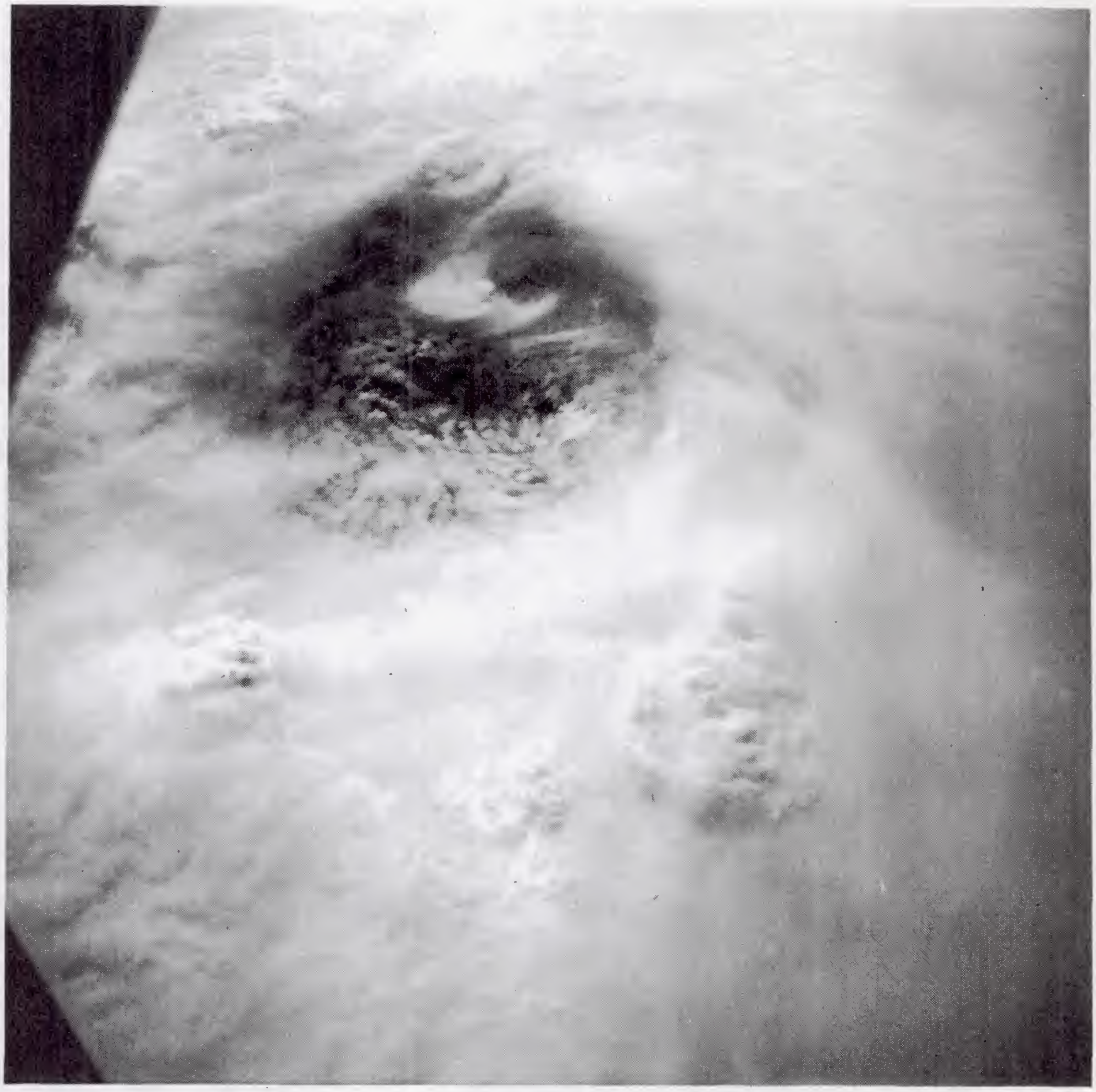


Figure XVIII-2. - Hurricane Gladys photographed from ESSA-7 (meteorological satellite), October 17, 1968.



AS7-8-1930

Figure XVIII-3. - Eye of typhoon Gloria (western Pacific Ocean) taken at 00:26 G. m. t., October 20, 1968.

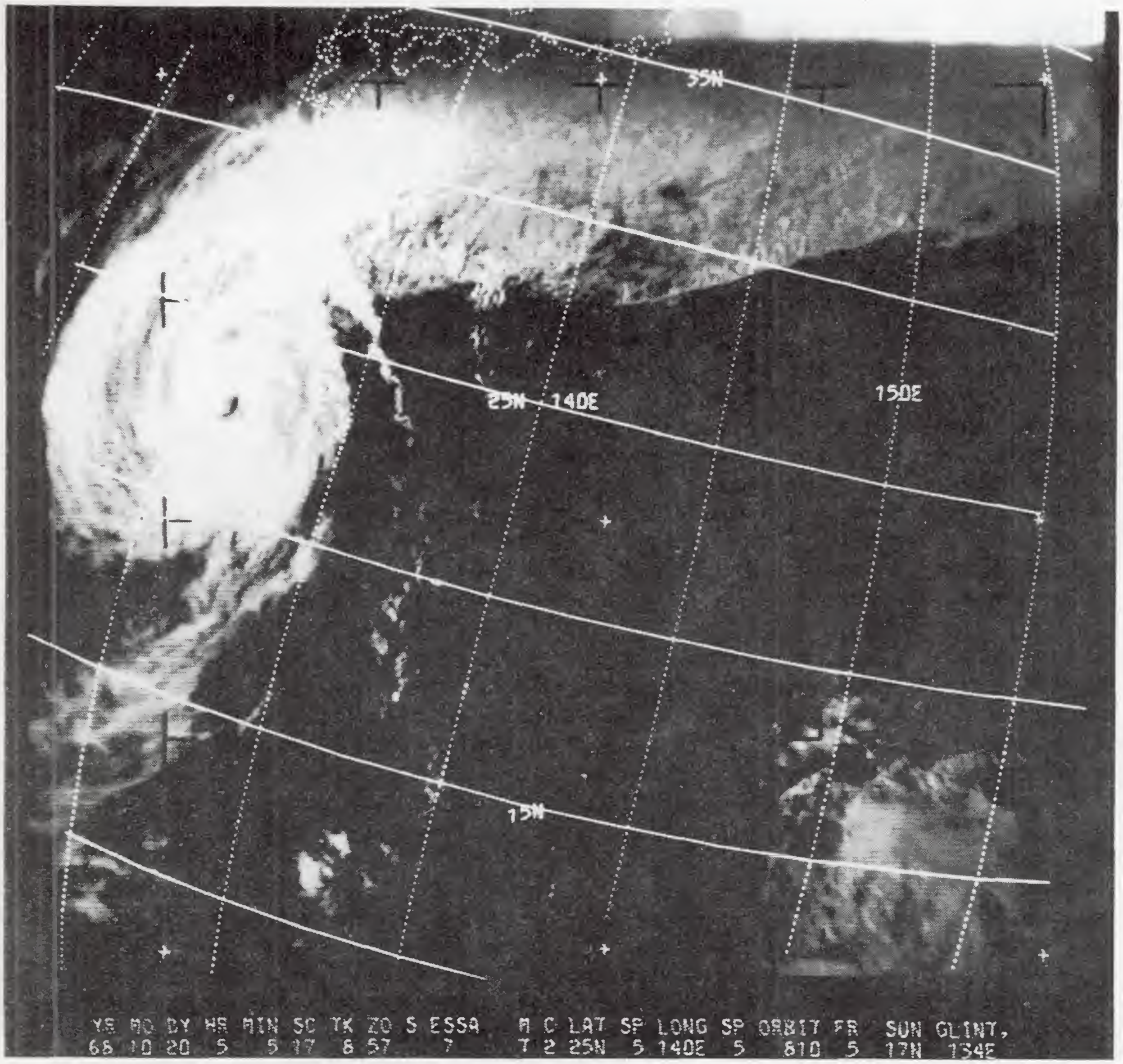
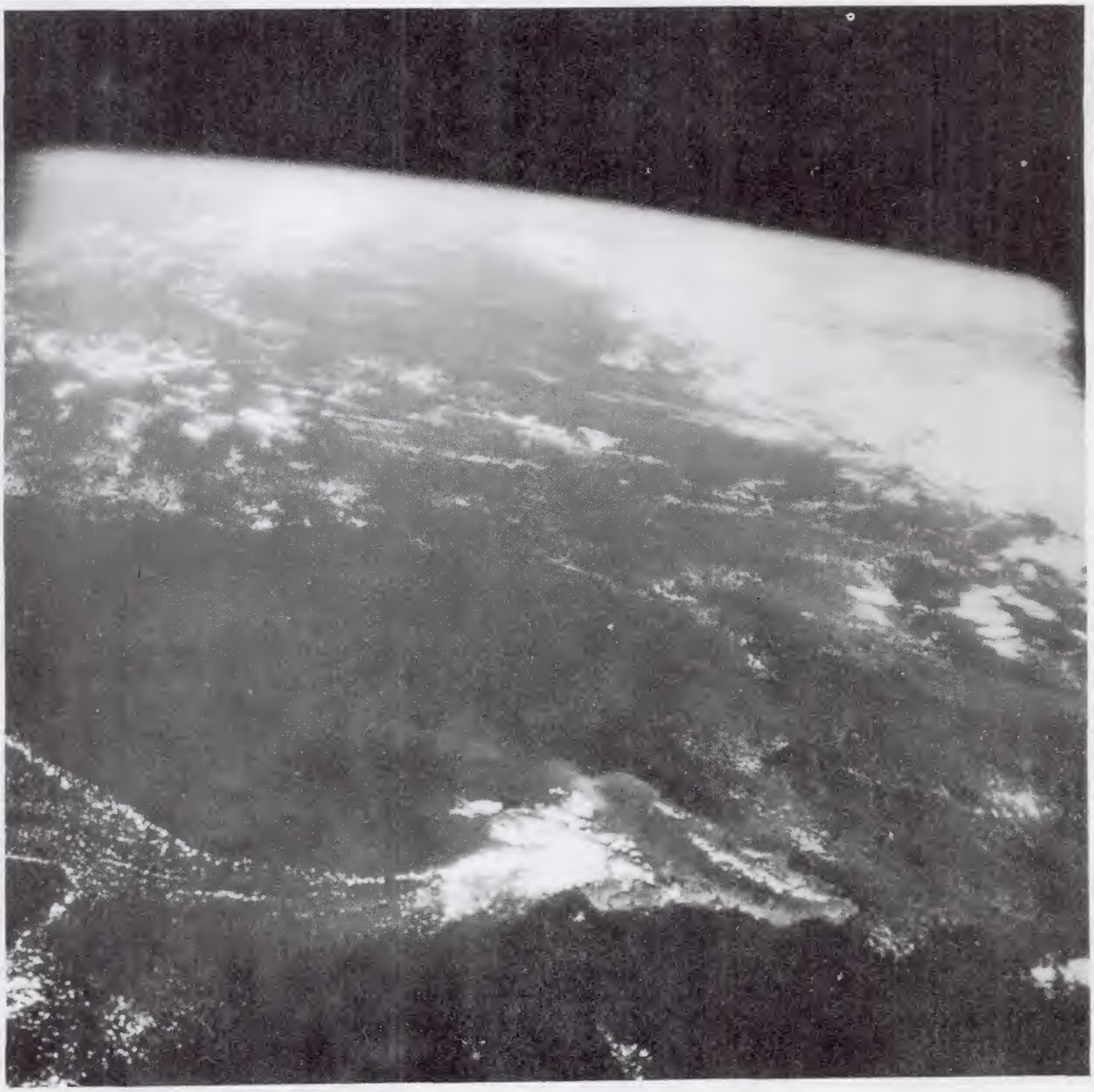
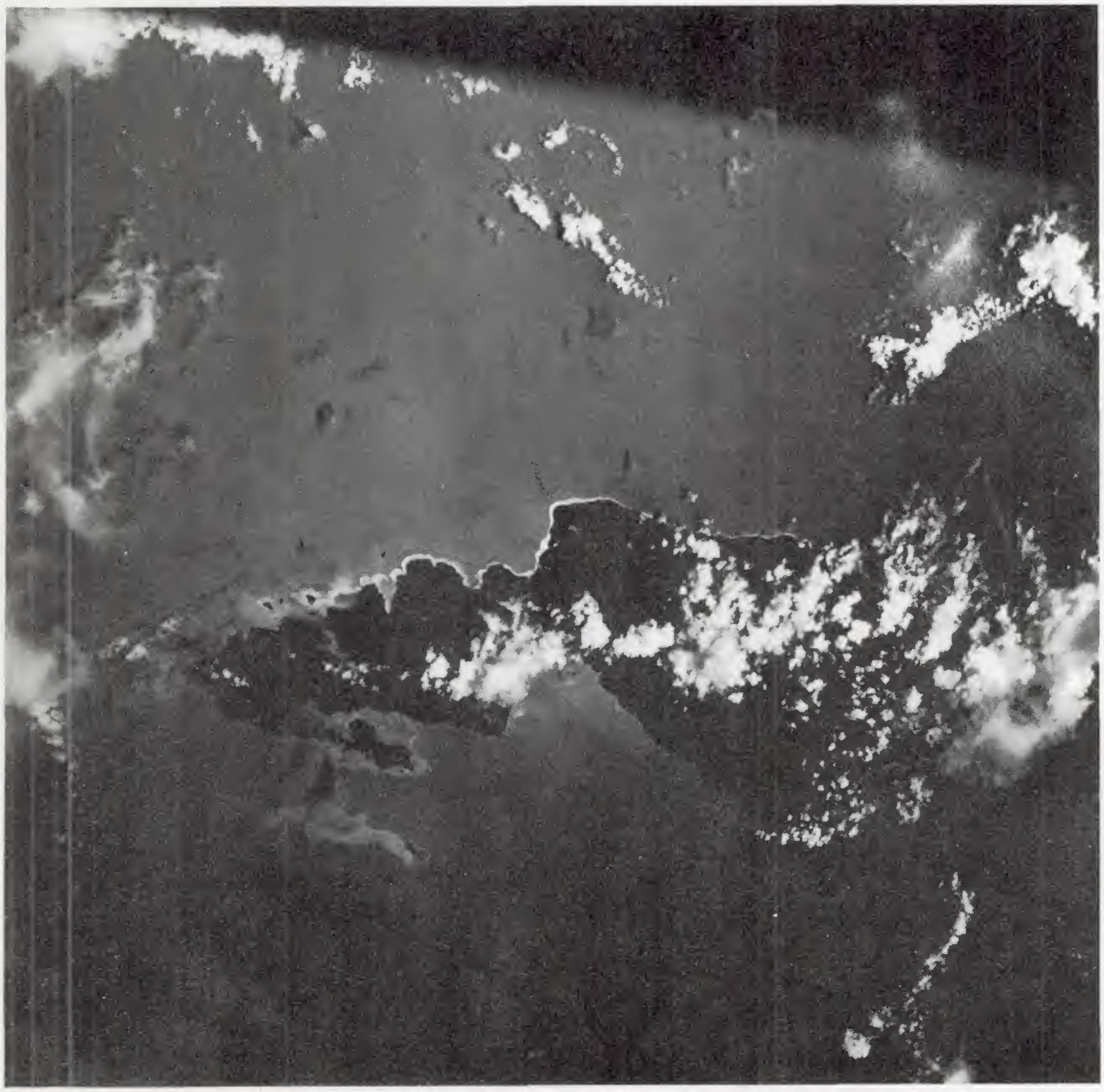


Figure XVIII-4. - Typhoon Gloria photographed from ESSA-7 at 05:05 G. m. t., October 20, 1968.



AS7-7-1741

Figure XVIII-5. - Northerly view of Oahu in the Hawaiian Islands taken at 00:01 G. m. t., October 15, 1968.



AS7-4-1670

Figure XVIII-6. - Supiori and Biak Islands in Indonesia are surrounded by the reflection of the sun at 02:19 G. m. t., October 22, 1968.

XIX. METEOROLOGY

By William Nordberg and William Shenk
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APOLLO 7 PHOTOGRAPHY SCREENING REPORT

The following statements describe meteorological aspects of the photography:

1. The image quality of the normally exposed transparencies was satisfactory for meteorological purposes. Frames that were underexposed are unsatisfactory for the examination of cloud detail, especially cirrus clouds that are not easily seen, even in normally exposed transparencies. When prints are made, the brightness levels should be raised for the underexposed transparencies. The resolution was adequate for detecting the smallest scales of cumuliform cloudiness.

2. The Apollo 7 mission covered a wider range of meteorological situations than did either the earlier Gemini photography or the photography from the Apollo 6 mission. The photography methods were similar to the methods of Gemini missions, but a greater variety of meteorological subjects were present. However, the Apollo 7 mission had several photographic disadvantages when compared to the Apollo 6 mission. These disadvantages are as follows.

   a. Few of the photographs were taken with the principal point near the nadir.

   b. No transmissivity curves were prepared for the lens, filters, or the windows of the spacecraft.

   c. Image quality suffered from underexposed transparencies.

   d. Stereophotographic techniques could be employed on only a few of the photographs.

   e. No data were available on lens settings and shutter speeds.

3. A potential meteorological use of the photographs would be in a situation in which improving resolution would lead to clearer understanding of mesometeorological processes. Another potential use is for study of scales of cloudiness that cannot be examined with vidicon systems. Examples of such mesometeorological phenomena are: (a) sea breezes, (b) wave clouds, (c) cloud streets, (d) orographic cloudiness, (e) thunderstorms, (f) details of jetstream cirrus, and (g) small-scale features of tropical storms. Cloud statistics concerning the scales of cloudiness and earth cover can be generated through flying-spot scanner techniques.

Spectral-reflectance measurements of clouds and other surfaces are possible if camera-system calibration is performed. Albedos of these surfaces can then be determined. The computed albedos can be compared with other measurements from aircraft and laboratory.

Photographs not taken at an extremely oblique angle can be compared with other satellite pictures of the same area. Since the other systems (that is, Applications Technology Satellite (ATS) and Environmental Science Services Administration (ESSA)) have less resolution, the Apollo photographs can be used as ground truth to evaluate the television data from the ATS and ESSA satellites.

4. Research in two areas with the Apollo 7 photography is being considered. These areas are as follows:

a. Cloud statistics can be generated from pictures in which the principal point of a frame is not far from the nadir. Because studies are needed for the vertical soundings to be performed with meteorological satellites, these studies must be made both globally and with great spatial resolution. Existing data from ESSA and Nimbus provide the global coverage; Apollo 7 data (as well as other MSC data) provide the desired spatial resolutions in selected regions. If these missions were to have a greater orbit inclination, the data would be more useful.

b. Apollo 7 camera-system calibration would enable brightness and albedo studies of clouds and other surfaces to be conducted.

5. Screening team members from the Laboratory for Atmospheric and Biological Sciences (LABS) have made recommendations for future photographic missions. Considerable work has been done to prepare transmissivity curves for the optical system of the Apollo 6 mission. In order to properly relate brightness measurements acquired from the transparencies to albedos, brightness values should be obtained from light sources of known intensities. Albedos can be obtained by comparing the brightness measurements from the photography with the calibrated brightness values. On future missions, the cameras should be calibrated before the flight.

The capability of measuring albedos from orbital altitude could be more closely examined if simultaneous aircraft measurements were made with an optical system identical to the spacecraft system.

In the past, photography has been restricted to orbits with low inclinations. Many significant weather features are observable outside the belt of latitudes covered by low-inclination orbits. An inclination of 50° is suggested.

Photographic missions should be conducted in as systematic a fashion as possible. The Apollo 6 mission has been the most successful in this regard.

XX. METEOROLOGY

By Victor S. Whitehead
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NASA Manned Spacecraft Center
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The following comments apply to Apollo 7 photography.

1. Image quality ranged from poor to excellent. Improper exposure was apparently the primary cause of poor quality in some frames.

2. Overall quality of the better exposures was similar to that of the Gemini series but poorer than that of the Apollo 6. The greatest difficulty with this photography compared to Apollo 6 is the lack of complementary information. Location of event and time of exposure are only grossly estimated unless there are identifiable terrain features in the field of view. This makes it impossible to relate the photographed cloud features to other meteorological information. The oblique views have both favorable and unfavorable aspects. More area is shown in the oblique views than in nadir photographs. This gives a better quantitative view of the "big picture;" however, quantitative information is lost to some degree. It is not possible to determine the fraction of the sky covered by clouds or to compare the size of different clouds. Stereophotographic capability is reduced extensively.

The concept of photographing interesting targets of opportunity provides a concentration of events of significant interest. This concentration is provided, however, without statistical data for analyses of representativeness of these events. There are an exceptionally large number of Apollo 7 frames depicting cloud streets. The impression is given that this is the normal and not exceptional case. Apollo 6 photography, however, indicated that these well-defined streets are the exception.

3. Use of the Apollo 7 photographs in objective studies will be severely restricted unless time and location of the views can be determined. There are sufficient photographs taken over known locations and at known times to provide useful information in a study of cloud streets. Investigators interested in hurricane dynamics will find the views of Gladys and Gloria helpful in studies. Both these storms exhibited unusual characteristics. The film can be used as a visual aid in demonstrating characteristics of the atmosphere such as sea-breeze effect, clearing over lakes and rivers, and the structure of mesoscale systems.

4. Preliminary plans for use of Apollo 7 photographs include the following aspects.

a. The environment associated with cloud streets will be studied to determine when this form of convection is most likely to occur.

b. Rope-like clouds over water, shown in frames AS7-8-1885 and AS7-8-1886, will be investigated to determine the nature of the phenomenon. (This investigation will be restricted by the location off the African coast.)

5. Recommendations for future photographic missions include the following details.

a. The log of time and location of the photographs should be given the same priority as the taking of the photographs.

b. Bracketed cameras with short focal lengths and nadir-photography capability are preferred for various purposes. Continuous strip photography such as that of Apollo 6 is to be encouraged when sufficient film can be carried.

c. For extended missions, such as Apollo 7, real-time ground-directed projects should be considered.

XXI. SPATIAL RESOLUTION IN MULTIBAND IMAGERY

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INTRODUCTION

Three questions raised at the aircraft review meeting and at the screening of the Apollo 7 photography, both held at MSC, were as follows:

1. Since multispectral signatures are used to interpret terrain features, can requirements for spatial resolution be decreased?

2. What important data cannot be extracted from present space photographs because of inadequate spatial resolution?

3. What steps are being taken to obtain a quantitative assessment of the image quality of space photographs?

The questions involve spatial resolution, limitations, and image quality.

SPATIAL RESOLUTION

If the terrain features spectrally reflected light as simple line spectra, then spatial resolution would, for general survey purposes, be of little importance, and coarse spatial resolution spectroradiometry would suffice. However, the spectral reflectance curves of terrain features show only continuous, slowly changing variations of reflectance with wavelength. Sometimes, little change occurs in the curve from one feature of interest to another. The shape of these curves is also a function of sun-target-camera angle, atmospheric backscatter, and many other variables difficult to measure. Under adequate spatial resolution, the problem of discriminating between features of interest and then identifying them is a complicated problem which requires diligence and experience in analysis.

An example of two adjacent fields containing crops of wheat and corn may be used to define adequate resolution. The spectral reflectance of the two crops is similar. If the resolution of the system were such that overlap occurred along the common side of the crops, careful observation might indicate the remaining portions of the two fields to be different in crop type and might further indicate one crop to be corn and the other wheat. Under these conditions, the resolution would be adequate. At a coarser resolution, the two fields would merge, as would the two spectral signatures. Under these conditions, it would be impossible to say whether there were two crops or only one.

It is perhaps instructive to think of spatial resolution as a type of spectral filter insofar as it separates features having different spectral reflectance characteristics. If the spatial resolution is adequate, it follows that a spectral signature is pure and not mixed in an undecipherable manner with a second spectral signature.

Spatial resolution is indispensable for shape determinations and, therefore, for important measurements of crop acreage.

LIMITATIONS

A second question raised concerned what cannot be seen on the space photography. Because of the initiative of Colwell and others, investigators are more aware of some of the advantages of space photography compared with aircraft and ground survey methods. Early reports on this type of study understandably tend to stress the advantages of space photography, and dwell little on the limitations. It is important to realize the limitations and to realize that many of the limitations are directly the cause of inadequate spatial resolution.

IMAGE QUALITY

The image quality assessment of space photographs is now underway at MSC. The method being used involves locating a straight edge (coastline, et cetera) present in a space photograph, taking the Fourier transform of a microdensitometer scan of the edge, and thus obtaining the modulation transfer function (MTF) of the camera system under the prevailing conditions. The MTF represents the modulation in the photographic image for all spatial frequencies up to the resolution cut-off of the system. It takes into account all degrading factors such as atmospheric contrast attenuation and turbulence, window imperfections, the lens MTF, the film MTF, camera vibration, and movement.

The technique is in early development at MSC, but in the future, it should provide useful quantitative data on system performance. The results may be used in diagnosing the factors that most seriously degrade the photography. For example, to what extent are the white lenticular particles deposited on the windows?

RECOMMENDATIONS

The following are the recommendations for use in multiband imagery:

1. Continue to develop higher angular resolution space photography.

2. Continue with simultaneous aerial photography during future space photography missions. Use the comparison between aerial and space photography in support of development of higher angular resolution space photography.

3. Simultaneous aerial photography will be of importance when the first multiband camera system is used in space. Then, simultaneous aerial photography will be vital in order to log information regarding exposure time, f-number, time of day, and sun-target-camera angle for both aerial and space photography.

4. Continue to obtain overlapping photography, such as from Apollo 6, for use in simple cartographic studies.

5. Proceed with the edge-analysis technique to furnish quantitative system performance data and to diagnose image-degrading factors.

6. Of importance to the future of space multiband photography is the suggested approach of using several return-beam vidicon cameras in a multiband mode. This approach leaves a lot to be desired in that the data obtained may be uninterpretable. An image-tube approach has been suggested which appears more promising because the tight spectrophotometric and image registration tolerances required for multiband photography seem to be readily soluble.

Manned Spacecraft Center
National Aeronautics and Space Administration
Houston, Texas, June 6, 1969
160-75-02-03-72

APPENDIX A

APOLLO 7 MISSION DATA AND INFORMATION LIST FOR 70-MILLIMETER COLOR PHOTOGRAPHY

SUMMARY

The Apollo 7 crew exposed nine magazines of 70-mm film during the October 1968 flight. Two magazines contained Kodak type SO-368 film, two contained Kodak type 3400 film, and five contained Kodak type SO-121 film. Seven of the nine magazines, which include 493 frames of usable imagery, are described in this appendix. A descriptive outline including evaluation methods and mission parameters has been compiled. The frame number, orbit, date, season, local solar time, ground elapsed time, sun elevation, coordinates, and scale were compiled as useful support data for each frame evaluated. Photographic map plots, altitudes, percentage of cloud cover, and an image evaluation were compiled for data enhancement. The description of the imagery by discipline is included to aid the user in a more detailed evaluation of Apollo 7 imagery.

INTRODUCTION

The information obtained from the photographs taken during the Apollo 7 mission proved to be valuable. Photography was acquired of areas which have never been photographed from spacecraft altitudes. The photographic attitudes ranged from near vertical to high oblique and from underexposed to overexposed photographic quality. Photographic altitudes ranged from 88 to 198 n. mi., with an average range of 120 to 130 n. mi. Sun angles for the exposures varied from 5° to 84°. A wide range of factors affected the overall quality of the imagery.

The mission data and the information list for the Apollo 7 photographs were compiled by the Mapping Sciences Laboratory. The portion of the report (table A-I) which deals with the total number of frames pertaining to a single discipline is a guide to the user of the photography. The information should enable the user to select quickly the frames which apply to his specific discipline. No attempt has been made to establish the frames that have the largest percentage of single-discipline occurrence, but only that the particular frame in question does contain major features of interest to that discipline. Some photographs contain features pertaining to a number of disciplines.

DISCUSSION

Mission

The primary mission objectives were to test the command module performance and capabilities. The mission was a 10-day earth-orbital operations mission. The

launch azimuth was 72° from true north, with an orbit inclination of 33° to the equator. As a secondary mission objective, photographs were obtained from 35° north latitude to 35° south latitude, over a period of 157 orbits. Targets of weather and terrain were of prime importance. Additionally, the areas can be studied from a different perspective and included in the earth resources survey. Each area photographed was analyzed in a generalized manner for additional study to be performed in specific related disciplines of geography-cartography, geology-hydrology, agriculture, forestry, meteorology, and oceanography.

World Apollo Index Map

Figures A-1, A-2, and A-3 illustrate the extent and location of all the Apollo 6 and the majority of the Apollo 7 photographic coverage over land areas. All the Apollo 7 photographic coverage from magazines M to S is listed in table A-II. The limits of frame coverage were extracted from previously compiled Operational Navigation Charts (ONC) plots. Figures A-4 and A-5 show enlarged segments of the Baja California area and the Sinai Peninsula. The areas were photographed extensively and appear as heavy line congestion on the World Apollo Index Map. The purpose of the enlargement is to reduce line congestion for easy frame limit identification.

Camera Data

Basic camera data are as follows:

1. Camera: Hasselblad 500-C NASA modified, 70-mm, Serial No. 023
2. Lens: Zeiss Planar, f/2.8, 80-mm focal length
3. Aperture setting: f/2.8 to f/22
4. Shutter: Between the lens
5. Film-filter combination in each magazine:

Magazine	Film type	Filter	Frame numbers
M	SO-368	None	AS7-3-1511 to AS7-3-1557
N	SO-368	None	AS7-4-1558 to AS7-4-1612
Q	SO-121	2A	AS7-5-1613 to AS7-5-1671
O	SO-121	2A	AS7-6-1672 to AS7-6-1737
S	SO-121	2A	AS7-7-1738 to AS7-7-1879
R	SO-121	2A	AS7-8-1880 to AS7-8-1943
P	SO-121	None	AS7-11-1979 to AS7-11-2043

Magazine V (frames AS7-9-1944 to AS7-9-1948) and magazine U (frames AS7-10-1949 to AS7-10-1978) were not included in this evaluation because of a malfunction in the camera system.

Film and Filter Data

The film used was Eastman Kodak type SO-368 (medium speed Ektachrome, ASA-64) and Eastman Kodak type SO-121 (high-resolution Aerial Ektachrome, AEI-6). The film was 70 mm wide, 2.5 mil thick, and had a polyester base. The frame format was 55.5 by 55.5 mm. The filters were of the Wratten 2A type in which the lower limit of transmittance is 4100 angstroms.

Equipment/Data Used for Interpretation

Optical equipment used in interpretation of the transparency media included the following: tube magnifiers (X7), linen testers (X5), folding hand stereoscopes (X2 and X4), and binocular zoom stereoscopes (X.07 to X30). Rear projection viewers (X3, X4, X8, X12, and X24) were also used.

Screening Information List Explanation

A column-by-column explanation of the screening information list (table A-II) is as follows:

Frame number. - The photographic frames from the Apollo 7 mission were from frame AS7-3-1511 to frame AS7-8-1943 and from frame AS7-10-1949 to frame AS7-11-2043. The frames were exposed in seven magazines.

Orbit number. - The orbit numbers designate the orbit in which the frame was exposed.

Date. - The date is the day on which the frame, on its designated orbit, was exposed.

Seasons. - Apollo 7 photographs were taken during October. The season in the areas north of 15° north latitude is fall, and the season in the areas south of 15° south latitude is spring. In the tropical latitudes, areas between latitudes 15° north and 15° south, there is a small annual temperature range, resulting in a lack of distinct fall, winter, spring, and summer seasons. The principal determinant factor of seasons in tropical areas is the extent and distribution of moisture, which results in a tropical climate of hot-wet and cool-dry seasons.

Ground elapsed time. - The time designation is initiated from the time of launch through the entire mission on a continuous basis starting at 000 hr 00 min 00 sec. The listing is only recorded in hours and minutes and was extracted from the orbit trace. The exact geographic position of the spacecraft at the time of exposure cannot be determined by the resulting imagery without extensive analytical photogrammetric resection and mensuration. Camera orientation angles and spacecraft altitudes are inconsistent for quick nadir point location determination. In most frames, the image format is obscured by the limits of the spacecraft windows. In a few cases, the horizon is available for accurate tilt axis analysis or principal line construction on the imagery.

Since the exact nadir point location is difficult to determine from the photography, the possibility of determining an exact ground elapsed time (g. e. t.) from the imagery is improbable. The g. e. t. for each frame has been extracted from the "Apollo 7 Preliminary Report." These exposure times are approximate and intended only as an aid to the user.

Local solar time. - Local solar time, for a particular frame, is that time at or near the principal point at the time of exposure and is based upon the G. m. t. of the exposure and the geographic position of the principal point. The time change constant applied to the calculation of local solar time is 4 minutes for every 1° of longitude change. Local time corridors were not taken into consideration for this computation.

Sun elevation. - The local sun elevation is an approximate value that indicates the angle of the sun above the horizon for a particular time and location and is intended only as a guide to the user. These values were extracted from the "Apollo 7 Preliminary Report" and are used as support data.

Principal point. - Each photograph that contained enough landmass for geographical identification was plotted on World Aeronautical Charts (WAC) 1:1,000,000 or on Operational Navigation Charts 1:1,000,000. In many instances, the map or photographic detail was insufficient for photographic frame plotting. The photograph principal points, once established on the photographs, were plotted on the map source by a detailed comparison of photographic imagery (at the principal point) with map detail. In some instances, the terrain at the principal point, even in near-vertical imagery, contained inadequate topographic character for image transfer. On those frames in which the principal point falls over water or cloud-covered areas and too far from landmass for even approximate placement, the principal point was not plotted.

The principal points for high oblique frames were not plotted because of the lack of visible detail near the center of the photograph. However, when the principal point could be transferred from the photograph to the map source, the geographic coordinates were scaled and recorded to the nearest minute of latitude and longitude of the point. These values, which were extracted from map sources, are in most cases accurate to ± 30 minutes of latitude and longitude. The resulting values appear in the tables as principal point latitude and longitude.

In cases where it was not possible to establish the principal point because of one or more of the previously mentioned reasons, the latitude and longitude of the principal point for that particular frame were extracted from the "Apollo 7 Preliminary Report." These values are designated by an asterisk. The coordinates are only approximate and generally are accurate to ± 1°. They are intended to give the user the approximate location of the principal points.

Approximate scales at the principal point. - The established scales of Apollo 7 photographs are variable and approximate. A majority of the frames were exposed at various angles of camera attitude and spacecraft altitudes, which constantly changed the scale of the photographs along the axis of tilt. Scales will be constant along lines constructed perpendicular to the axis of tilt. To compute and construct a scale grid for each individual frame proved too time consuming. It was decided to determine the scale for a particular perpendicular under certain conditions.

If the conditions of reliable map sources and sufficient photographic detail were present, the scales along a line perpendicular to the axis of tilt and at the principal point could be determined. This was accomplished by the ratios of map scale, map distance as compared to photograph scale and photograph distance. The problem is that of having measurable image distances which correspond to measurable map distances, for example, drainage intersections, points on a coastline, highway intersections, small islands, et cetera. All measurements were made perpendicular to the tilt axis and as close to the principal point as possible. Scales of this type were determined only when the proper conditions prevailed and are meant only as a guideline for the user. They should not be used for precise photographic mensuration, and it should be remembered that the scales are only as reliable as the map source.

Map plots. - Figures A-6 and A-7 are indices published by the Aeronautical Chart and Information Center, denoting the sequence and location of the ONC series throughout the world. These maps, compiled at 1: 1, 000, 000 scale, were used for Apollo 7 photographic plotting. World Aeronautical Charts were used for plotting when Operational Navigation Charts were not available. The circumstances were infrequent and do not justify the incorporation of a WAC index in this publication. For each of the photographs, where a principal point was located, a designated ONC or WAC is recorded.

Altitude. - The spacecraft elevation above mean sea level, at the spacecraft nadir, is expressed in nautical miles.

Present cloud cover. - Clouds appear in more than 90 percent of Apollo 7 photography and obliterate a large percentage of the photographable landmass. Although cloud formations are of definite interest to a meteorologist or climatologist, their obscuring nature produces a problem to the earth resources investigator who is interested in the underlying terrain. It was decided therefore that the person (or persons) required to make photographic terrain analysis of Apollo 7 imagery should be forewarned regarding the approximate percentage of cloud cover of each frame. This was accomplished by placing a 100-unit proportionate grid, constructed to frame format requirements, over each frame. If a 1-percent square contained clouds over one-half its area, the cloud cover was considered to be 1 percent. Each square within the frame limits which contained actual imagery was counted and recorded as the percentage of cloud cover within that frame. When the frame was exposed for cloud-top brightness, the underlying imagery is dark. The presence or absence of clouds below the bright cloud barrier was impossible to verify. Therefore, the percentage of cloud cover is based entirely upon the uppermost apparent cloud cover.

Description by discipline. - The description of the current earth resource disciplines on Apollo 7 imagery was undertaken to aid the photoanalyst in his search for an aspect of his discipline occurring in each frame. When an aspect of a discipline did not appear to be contained within the frame limits, that discipline category was excluded from the frame description column.

The descriptions for each frame are short, concise general statements of occurrence. They are based upon visual inspection of the 70-mm film positive, with the aid of magnification devices. Only those discipline aspects which were most apparent to the evaluator were described. No attempt was made to perform a detailed analysis for any one discipline. The location of the desired discipline aspects within the frame has been denoted geographically — not by coordinates.

Geography and cartography, because of their closely related characteristics, were combined into one description. The same is true of geology and hydrology. The other disciplines were agriculture, forestry, meteorology, and oceanography.

Image evaluation (denoted in parentheses at the end of the geography description) was devised as a rapid method for determining exposure quality. The three descriptive terms used to denote exposure quality are simple and concise. The terms light, normal, and dark denote overexposure, normal exposure, and underexposure, respectively. This guideline should enable the investigator to eliminate, or at least grade, those frames which are applicable for his particular discipline evaluation.

CONCLUSIONS

The data and information contained in this appendix are intended to aid the scientist in selecting the frames most suited to his needs and to provide him with basic information concerning the selected frames, as an aid in the analysis of the Apollo 7, 70-mm color photography.

Ideally, this information should accompany the photography that is provided to the scientists in the Earth Resources Program. Because of the amount of time necessary to compile the information, it could not be distributed at the same time as the photography. It is hoped that there will be a continued demand for Apollo photography for scientific analysis. The data and information in this report should be an invaluable aid in the initial stages of scientific investigations.

BIBLIOGRAPHY

Following is a list of reference materials that were used in the evaluation of Apollo 7 imagery.

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Topographic Maps. (AMS) 1:250,000.

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Goode's World Atlas. Goode, J. P.; and Espenshade, E. B.: Rand McNally Co., 1965.

Major Forest Types in the United States. (USDAFS) 1:5,000,000.

Apollo 7 Preliminary Report. Photographic Technology Laboratory, November 1968.

Apollo 7-205 Preliminary Plotting and Indexing Report. Mapping Sciences Laboratory. November 1968.

WAC Charts, 1:1,000,000.

TABLE A-I. - FRAMES PERTAINING TO EACH DISCIPLINE

Oceanography	Geography-cartography	Agriculture	Geology-hydrology	Forestry	Meteorology
AS7-4-1590 to 1592	AS7-3-1528 to 1536	AS7-3-1529 to 1532	AS7-3-1528 to 1531	AS7-3-1528 to 1532	AS7-3-1528 to 1532
AS7-4-1594 and 1595	AS7-3-1541 to 1546	AS7-5-1613 to 1615	AS7-3-1541 to 1545	AS7-4-1593 to 1595	AS7-3-1536 to 1556
AS7-4-1607 and 1608	AS7-4-1590 to 1595	AS7-5-1624	AS7-4-1593 and 1594	AS7-4-1607 to 1611	AS7-4-1590 to 1595
AS7-4-1611	AS7-4-1604	AS7-5-1626	AS7-5-1613 to 1643	AS7-5-1613 to 1616	AS7-4-1606 to 1612
AS7-5-1613	AS7-4-1607 to 1612	AS7-5-1629 to 1636	AS7-5-1645 to 1652	AS7-5-1626 and 1627	AS7-5-1617 to 1619
AS7-5-1615	AS7-5-1613 to 1643	AS7-5-1641	AS7-5-1654 and 1655	AS7-5-1629 to 1638	AS7-5-1624 to 1630
AS7-5-1619	AS7-5-1645 to 1652	AS7-5-1643	AS7-5-1657 to 1662	AS7-5-1640 to 1643	AS7-5-1634 to 1655
AS7-5-1623 and 1624	AS7-5-1654 to 1670	AS7-6-1693	AS7-5-1666 and 1667	AS7-5-1647 to 1652	AS7-5-1658 and 1659
AS7-5-1626 to 1636	AS7-6-1672 to 1680	AS7-6-1699	AS7-6-1693 to 1705	AS7-5-1662	AS7-5-1662 to 1666
AS7-5-1638 to 1642	AS7-6-1693 to 1708	AS7-6-1700 to 1702	AS7-6-1713 to 1726	AS7-5-1666	AS7-5-1668 to 1671
AS7-5-1649 to 1652	AS7-6-1712 to 1726	AS7-6-1717 and 1718	AS7-6-1731 to 1737	AS7-6-1693 to 1699	AS7-6-1675 to 1689
AS7-5-1654 and 1655	AS7-6-1731 to 1737	AS7-6-1720 to 1725	AS7-7-1740 to 1750	AS7-6-1701 to 1705	AS7-6-1693 to 1700
AS7-5-1661	AS7-7-1737 to 1760	AS7-6-1731 to 1733	AS7-7-1752 to 1759	AS7-6-1716 to 1718	AS7-6-1702 to 1737
AS7-5-1666	AS7-7-1764 to 1785	AS7-6-1736 and 1737	AS7-7-1764	AS7-6-1720 to 1725	AS7-7-1738 to 1747
AS7-5-1670	AS7-7-1787 to 1800	AS7-7-1773 and 1774	AS7-7-1772 to 1781	AS7-6-1732	AS7-7-1749 to 1774
AS7-6-1680	AS7-7-1802 to 1824	AS7-7-1796	AS7-7-1783 to 1790	AS7-7-1748 and 1749	AS7-7-1776 to 1790
AS7-6-1694 to 1697	AS7-7-1826 to 1832	AS7-7-1798	AS7-7-1793 to 1800	AS7-7-1769 and 1770	AS7-7-1792 to 1808
AS7-6-1699 to 1705	AS7-7-1835 to 1879	AS7-7-1831	AS7-7-1802	AS7-7-1777 and 1778	AS7-7-1810 to 1816
AS7-6-1716	AS7-8-1880 to 1888	AS7-7-1835	AS7-7-1804	AS7-7-1781	AS7-7-1819 to 1828
AS7-6-1717	AS7-8-1891 to 1894	AS7-7-1837 to 1839	AS7-7-1807 to 1813	AS7-7-1783 and 1784	AS7-7-1830 and 1831
AS7-6-1720 and 1721	AS7-8-1896 to 1903	AS7-7-1844	AS7-7-1817 to 1819	AS7-7-1789	AS7-7-1833 to 1854
AS7-6-1723 to 1726	AS7-8-1905 to 1914	AS7-7-1849	AS7-7-1824	AS7-7-1797	AS7-8-1861 to 1878
AS7-6-1731	AS7-8-1916 to 1918	AS7-7-1868 and 1869	AS7-7-1826 to 1832	AS7-7-1799	AS7-8-1879 to 1880
AS7-7-1733 to 1738	AS7-8-1920 to 1922	AS7-8-1899	AS7-7-1835	AS7-7-1809	AS7-8-1883 to 1888
AS7-7-1740 to 1747	AS7-8-1924 to 1928	AS7-8-1900	AS7-7-1837 to 1839	AS7-7-1811 and 1812	AS7-8-1891 to 1899
AS7-7-1751 to 1756	AS7-8-1931 to 1943	AS7-8-1910	AS7-7-1841 to 1845	AS7-7-1830 and 1831	AS7-8-1901 to 1904
AS7-7-1760	AS7-11-1979	AS7-8-1916 to 1918	AS7-7-1849 to 1853	AS7-7-1835 to 1839	AS7-8-1907 to 1914
AS7-7-1769	AS7-8-1980 to 1985	AS7-8-1928	AS7-7-1856 and 1857	AS7-7-1843 to 1845	AS7-8-1919 to 1927
AS7-7-1772 to 1774	AS7-8-1987 to 1993	AS7-8-1942	AS7-7-1859 to 1864	AS7-7-1850 and 1851	AS7-8-1929 to 1932
AS7-7-1777 to 1781	AS7-8-1996 to 2003	AS7-11-1980	AS7-7-1867 to 1873	AS7-7-1855 and 1856	AS7-8-1934 to 1937
AS7-7-1811	AS7-8-2006 to 2013	AS7-11-2006 to 2009	AS7-8-1880 and 1881	AS7-7-1861	AS7-8-1939 to 1943
AS7-7-1831	AS7-8-2015 to 2041	AS7-11-2020 to 2034	AS7-8-1887 and 1888	AS7-7-1863	AS7-9-1944 to 1948
AS7-7-1843 and 1844			AS7-8-1893 and 1894	AS7-7-1868 to 1873	AS7-10-1949 to 1978
AS7-7-1867			AS7-8-1896 to 1903	AS7-8-1880 and 1881	AS7-11-1979 to 1984
AS7-8-1880 and 1881			AS7-8-1905 to 1914	AS7-8-1887 and 1888	AS7-8-1985 to 1987
AS7-8-1884			AS7-8-1916 to 1918	AS7-8-1894	AS7-8-1890
AS7-8-1888			AS7-8-1920 to 1922	AS7-8-1897 to 1903	AS7-8-1893
AS7-8-1894 to 1899			AS7-8-1924 and 1925	AS7-8-1905 to 1914	AS7-8-1896 and 1897
AS7-8-1901 and 1902			AS7-8-1927 and 1928	AS7-8-1917 and 1918	AS7-11-2001
AS7-8-1907			AS7-8-1931	AS7-8-1920	AS7-11-2003 to 2023
AS7-8-1909 and 1910			AS7-8-1936	AS7-8-1922	AS7-11-2027 to 2041
AS7-8-1913 and 1914			AS7-8-1938 to 1943	AS7-8-1924 and 1925	
AS7-8-1918			AS7-11-1979 to 1985	AS7-8-1927 and 1928	
AS7-8-1927 and 1928			AS7-11-1988 to 1993	AS7-8-1931 and 1932	
AS7-8-1931			AS7-11-1996 to 2003	AS7-8-1936	
AS7-8-1933 and 1934			AS7-11-2006 to 2013	AS7-8-1941 to 1943	
AS7-8-1938 and 1939			AS7-11-2015 to 2033	AS7-11-1979 to 1985	
AS7-8-1943				AS7-11-1999	
AS7-8-1983 and 1984				AS7-11-2001	
AS7-11-1996 and 1997				AS7-11-2012 and 2013	
AS7-11-2001 and 2002				AS7-11-2020 to 2040	
AS7-11-2024 to 2027					
AS7-11-2033 to 2041					

TABLE A-II. - SCREENING INFORMATION LIST

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1511	2	10/11											30	Congo, coastal area, out of focus (Normal)
1512	2	"											--	Condensation (Dark)
1513	2	"											--	" (Dark)
1514	2	"											--	Spacecraft window (Light)
1515	2	"											--	" " (Dark)
1516	2	"											--	Spacecraft window (Dark)
1517	"	"											--	" " (Dark)
1518	"	"											--	S-IVB booster and condensation (Dark)
1519	"	"											--	" " " " (Dark)
1520	"	"											--	Blank (Dark)
1521	"	"											36	S-IVB booster (Dark)
1522	"	"											60	" " (Normal)
1523	"	"											50	S-IVB booster (Normal)
1524	"	"											45	" " (Normal)
1525	"	"											41	S-IVB booster (Normal)
1526	"	"											30	" " (Normal)
1527	"	"											95	S-IVB booster, clouds (Normal)
1528	"	"	Fall	03:07	11:00	46°	30°31'N	115°56'W	1:4,250,000		H-22	125	20	GEOGRAPHY/CARTOGRAPHY: Baja California, Sierra San Pedro Martir Mountains, Rio San Rafael, Bay of San Quintin. (Normal) GEOLOGY/HYDROLOGY: Complex mountains highly faulted. and folded, and elevated alluvial plains. Intermittent drainage is well defined. FORESTRY: Scattered low shrubform. METEOROLOGY: Alto-cumulus clouds. OCEANOGRAPHY: Sediment flow from Colorado River.
1529	"	"	Fall	03:08	10:34	47°	30°32'N	114°21'W			H-22	125	5	GEOGRAPHY/CARTOGRAPHY: Baja California, Gulf of California, Mexico, Puerto Penasco, Mouth of Colorado. (Normal) AGRICULTURE: Dry land cultivation, irrigated. GEOLOGY/HYDROLOGY: Complex mountains, alluvial plains and erg desert, all containing intermittent drainage. FORESTRY: Scattered low shrubform. METEOROLOGY: Strato-cumulus and Alto-cumulus. OCEANOGRAPHY: Sediment flow from Colorado River.
1530	"	"	Fall	03:08	10:37	47°	30°20'N	113°44'W			H-22	125	5	GEOGRAPHY/CARTOGRAPHY: Baja California, Gulf of California, Mexico, Bay of DeAduar, Bay of San Jorge. (Normal) AGRICULTURE: Extensive dry land cultivation, irrigated. GEOLOGY/HYDROLOGY: Deltaic and elevated erg plains with complex mountains in the background. FORESTRY: Scattered low shrubform. METEOROLOGY: Cirro-cumulus. OCEANOGRAPHY: Sediment flow from Colorado River.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINCIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1531	2	1968 10/11	Fall	03:08	10:41	47°	30°37'N	112°57'N			H-22	125	0	GEOGRAPHY/CARTOGRAPHY: Gulf of California, Mexico, Caborca, Magdalena River. (Normal) AGRICULTURE: Irrigated dry land cultivation, along drainage. GEOLOGY/HYDROLOGY: Highly dissected hills and mountains with intermittent stream beds. FORESTRY: Scattered low shrubform, some coniferous forest at higher elevations. METEOROLOGY: Cirrus, small alto-cumulus. OCEANOGRAPHY: Some tonal changes.
1532	"	"	Fall	03:08	10:43	47°	30°58'N	111°03'W			H-22	125	2	GEOGRAPHY/CARTOGRAPHY: Gulf of California, Mexico, Nogales, Arizona, Magdalena River. (Normal) AGRICULTURE: Dry land cultivation along drainage. GEOLOGY/HYDROLOGY: Complex hills and mountains. FORESTRY: Scattered shrubform, some coniferous forests at higher elevations. METEOROLOGY: Cirrus. OCEANOGRAPHY: Some tonal changes.
1533	"	"	Fall	03:09	11:02	47°	31°00'N	107°30'W				125	15	GEOGRAPHY: S-IVB booster, Arizona. (Blurred)
1534	"	"	Fall	03:09	11:06	48°	30°30'N	106°30'W			H-23	125	20	GEOGRAPHY: Arizona, New Mexico, Texas, S-IVB booster. (Normal)
1535	"	"	Fall	03:09	11:12	48°							30	GEOGRAPHY: Texas, S-IVB booster. (Normal)
1536	"	"	Fall	03:10	11:17	48°						126	15	GEOGRAPHY: Texas, S-IVB booster. (Normal)
1537	"	"	----	03:10	-----	49°						126	50	Clouds, S-IVB booster (Normal)
1538	"	"	----	03:11	-----	50°						126	95	Clouds, S-IVB booster (Normal)
1539	"	"	----	03:12	-----	--						126	100	Clouds, S-IVB booster (Normal)
1540	"	"	----	03:13	-----	--						126	95	Clouds, S-IVB booster (Normal)
1541	"	"	Fall	03:13	12:16	--					H-25	126	80	GEOGRAPHY/CARTOGRAPHY: Mississippi Sound, Gulfport, Biloxi, Hattiesburg. (Normal) GEOLOGY/HYDROLOGY: Atlantic Coastal Plain deposits. METEOROLOGY: Strato-cumulus, some alto-cumulus. OCEANOGRAPHY: Some tonal changes.
1542	"	"	Fall	03:14	12:17	48°					H-25	126	70	GEOGRAPHY/CARTOGRAPHY: Mississippi Sound, Biloxi, and coastal beaches. (Normal) GEOLOGY/HYDROLOGY: Marine and coastal plain region. METEOROLOGY: Cirro-cumulus, alto-cumulus, strato-cumulus. Cumulus. OCEANOGRAPHY: Sediment flows, fresh, salt water inner-face.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1543	2	1968 10/11	Fall	03:15	12:36	48°					H-25	126	65	GEOGRAPHY/CARTOGRAPHY: Florida, Pensacola, Panama City, Appalachicola. (Normal) GEOLOGY/HYDROLOGY: Submerged coastline and coastal plain deposits. METEOROLOGY: Strato-cumulus, alto-cumulus. OCEANOGRAPHY: Sediment flows, submerged sandbars.
1544	3	"	Fall	03:16	12:51	48°	28°56'N	82°31'W			H-25	126	70	GEOGRAPHY/CARTOGRAPHY: Florida, Cape Kennedy, Daytona, Orlando, Lake McCoy. (Normal) GEOLOGY/HYDROLOGY: Low coastal plain region with karst topography inland. METEOROLOGY: Cirrus, cumulus, towering cumulus. OCEANOGRAPHY: Coastline.
1545	3	"	Fall	03:16	12:53	48°	28°55'N	82°40'W			H-25	127	60	GEOGRAPHY/CARTOGRAPHY: Florida, Cape Kennedy, Titusville, Daytona. (Normal) GEOLOGY/HYDROLOGY: Low coastal plain region with karst topography inland. METEOROLOGY: Cirrus, cumulus, towering cumulus. OCEANOGRAPHY: Well developed beach pattern.
1546	3	"	Fall	03:16	13:08	48°	28°00'N	82°20'W			H-25	127	75	GEOGRAPHY/CARTOGRAPHY: Florida, Cape Kennedy, Titusville, Daytona Beach. (Normal) METEOROLOGY: Cumulus, some alto-cumulus. OCEANOGRAPHY: Some color changes.
1547	3	"	----										100	METEOROLOGY: Strato-cumulus and high altitude clouds. (Normal)
1548	3	"	----										100	METEOROLOGY: Strato-cumulus and high altitude clouds. (Normal)
1549	3	"	----										45	METEOROLOGY: Cumulus in linear arrangement, alto-cumulus, cirrus. (Normal)
1550	3	"	----										50	METEOROLOGY: Cumulus in linear arrangement, alto-cumulus, cirrus. (Normal)
1551	3	"	----										50	METEOROLOGY: Cumulus, alto-cumulus, cirrus. (Normal)
1552	3	"	----										--	OVEREXPOSED: (Light)
1553	3	"	----										100	METEOROLOGY: Cirrus, cumulus-nimbus. (Dark)
1554	3	"	----										100	METEOROLOGY: Cirrus, cumulus-nimbus. (Dark)
1555	3	"	----										65	METEOROLOGY: Strato-cumulus, alto-cumulus. (Normal)
1556	3	"	----										70	METEOROLOGY: Strato-cumulus, alto-cumulus. (Normal)

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1558	19	1968 10/12												Astronaut Schirra, Spacecraft Interior
1559	19	"												Astronaut Cunningham, Spacecraft Interior
1560	19	"												Rendezvous with S-IVB Booster
1561	19	"												Rendezvous with S-IVB Booster
1562	19	"												Rendezvous with S-IVB Booster
1563	19	"												Rendezvous with S-IVB Booster
1564	19	"												Rendezvous with S-IVB Booster
1565	19	"												Rendezvous with S-IVB Booster
1566	19	"												Rendezvous with S-IVB Booster
1567	19	"												Rendezvous with S-IVB Booster
1568	19	"												Rendezvous with S-IVB Booster
1569	19	"												Rendezvous with S-IVB Booster
1570	19	"												Rendezvous with S-IVB Booster
1571	19	"												Rendezvous with S-IVB Booster
1572	19	"												Rendezvous with S-IVB Booster
1573	19	"												Rendezvous with S-IVB Booster
1574	19	"												Rendezvous with S-IVB Booster
1575	19	"												Rendezvous with S-IVB Booster
1576	19	"												Rendezvous with S-IVB Booster
1577	19	"												Rendezvous with S-IVB Booster
1578	19	"												Rendezvous with S-IVB Booster
1579	19	"												Rendezvous with S-IVB Booster
1580														Fogged Spacecraft Window
1581														Spacecraft Window with Vapor
1582														Astronaut Schirra
1583														Astronaut Eisele
1584														Astronaut Eisele
1585														Astronaut Cunningham, Spacecraft Interior
1586														Astronaut Cunningham, Spacecraft Interior
1587														Spacecraft Interior, Blurred
1588														Astronaut Cunningham
1589														Astronaut Cunningham
1590	141	10/20	Spring	224:18	13:40	62°	16°00'S	145°15'W*				119	25	GEOGRAPHY/CARTOGRAPHY: Tuamotu Archipelago, View Southeast, Society Islands. (Normal) GEOLOGY/HYDROLOGY: Island chain of atolls. METEOROLOGY: Cirrus, small cumulus, alto-cumulus. OCEANOGRAPHY: Wave-action along coastline.
1591	141	10/20	Spring	224:18	13:40	65°	15°30'S	148°00'W*				120	35	GEOGRAPHY/CARTOGRAPHY: Tuamotu Archipelago, Rangroa, Tikahua, Society Islands. (Normal) GEOLOGY/HYDROLOGY: Island chain of atolls. METEOROLOGY: Cirrus, small cumulus, alto-cumulus. OCEANOGRAPHY: Wave-action along coastline.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1592	154	1968 10/21	Spring	243:57	14:18	47°	24°00'S	70°30'W*	1:6,666,670		P-26 Q-26, 27	172	38	GEOGRAPHY/CARTOGRAPHY: Chile, Argentina, Atacama Desert, Andes Mountains. (Normal) GEOLOGY: Narrow coastal plain and rugged complex mountain region. METEOROLOGY: Stratus, strato-cumulus. OCEANOGRAPHY: Shallow water in bay. Wave-action in bay areas.
1593	154	10/21	Spring	243:58	14:29	46°	23°00'S	67°29'W			P-26 Q-27	175	4	GEOGRAPHY/CARTOGRAPHY: Laguna Colorada, Bolivia, Salar de Atacama, Chile, Salar de Arizaro, Argentine. (Normal) GEOLOGY: Complex mountain region with karst topography and region of ferric mining. FORESTRY: Mountains in southeast forested. METEOROLOGY: Small cumulus.
1594	154	10/21	Spring	244:03	15:42	32°	31°08'S	51°02'W			R-24 Q-28	195	13	GEOGRAPHY/CARTOGRAPHY: Brazil, Uruguay, Lago dos Patos. (Normal) GEOLOGY: Coastal Plain with a shoreline region of emergence and lagoon regions. FORESTRY: Marsh along coastline. Dense forest. METEOROLOGY: Small cumulus, alto-cumulus. OCEANOGRAPHY: Shallow lagoon. Wave-action along the coastline, sediment movement along coastline.
1595	154	10/21	Spring	244:04	15:51	31°	28°58'S	49°24'W	1:4,062,500		Q-28	198	21	GEOGRAPHY/CARTOGRAPHY: Brazil, East Coast. Road Network. Scattered settlements. (Normal) GEOLOGY: Narrow Coastal Plain and complex mountain region. FORESTRY: Dense forest and coastal marsh grasses. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Continental Shelf. Continental slope interface.
1596														Astronaut Schirra. (Dark)
1597														Astronaut Cunningham. (Out of focus)
1598			Hot-Wet											GEOGRAPHY/CARTOGRAPHY: Brazil, Lagoa dos Patos. (Out of focus. Dark.)
1599	155												63	GEOGRAPHY/CARTOGRAPHY: Christmas Island. (Out of focus)
1600														Astronaut Eisele, spacecraft interior. (Dark)
1601 -														Spacecraft interior and window.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1602		1968												Spacecraft interior and window.
1603													75	METEOROLOGY: Cirrus, small cumulus.
1604	157	10/22	Fall	249:37	06:50	10°	27°30'N	92°30'E*			H-10	93	0	GEOGRAPHY/CARTOGRAPHY: Himalaya Mountains. (Light) GEOLOGY: Complex mountain region. METEOROLOGY: Alto-cumulus.
1605														Spacecraft window. (Light)
1606													27	METEOROLOGY: Strato-cumulus. (Dark)
1607	158	10/22	Spring	251:16	11:22		00°43'S	135°48'E	1:2,272,727		M-13	115	22	GEOGRAPHY/CARTOGRAPHY: Schouten-Eilanden Islands. Small scattered settlements along the coast. (Normal) GEOLOGY: Volcanic island chain. METEOROLOGY: Cumulus, cumulus-nimbus, cirrus. FORESTRY: Dense tropical forests. OCEANOGRAPHY: Waves along the coastline.
1608	158	10/22	Hot-Wet	251:20	12:19		09°04'S	148°52'E	1:3,000,000		N-15	130	47	GEOGRAPHY/CARTOGRAPHY: Cape Nelson, New Guinea, Solomon Sea, sketchy road pattern. (Normal) GEOLOGY: Coastal plain of island. FORESTRY: Dense tropical forests. METEOROLOGY: Cirrus, small cumulus, alto-cumulus. OCEANOGRAPHY: Waves in bay areas.
1609	158	10/22	Hot-Wet	251:21	12:29		08°48'S	152°43'E	1:3,846,150		N-15 K-9	140	29	GEOGRAPHY/CARTOGRAPHY: Woodlark Island, Solomon Sea. (Normal) GEOLOGY: Low marine island, bounded by coral reefs. FORESTRY: Dense tropical forests. METEOROLOGY: Cirrus, small cumulus, towering cumulus.
1610	159	10/22	Hot-Wet	252:42	10:25	63°	08°29'N	99°53'E			K-9 L-10	100	85	GEOGRAPHY/CARTOGRAPHY: Gulf of Thailand. Tha Mma Rat, Thailand. (Normal) GEOLOGY: Coastal plain region. FORESTRY: Intermittent forest. METEOROLOGY: Cirrus, small cumulus, alto-cumulus.
1611	159	10/22	Hot-Wet	252:47	11:34	83°	02°01'S	116°03'E	1:4,000,000		M-11	120	54	GEOGRAPHY/CARTOGRAPHY: Borneo Island, Makasser Strait. (Dark) GEOLOGY: Coastal plain region. FORESTRY: Dense forest. METEOROLOGY: Small cumulus, towering cumulus, alto-cumulus. OCEANOGRAPHY: Varying breadth of Continental Shelf.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	% CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1612	159	1968 10/22	Hot-Wet	252:50	12:09	84°	08°07'S	124°01'E	1:3,875,000		N-13	130	2	GEOGRAPHY/CARTOGRAPHY: Lesser Sunda Islands, Pulau Alor, Pulau Pantar, Pulau Lomblen. (Light) GEOLOGY: Complex mountain island chain. METEOROLOGY: Cirrus, cumulus.
1613	24	10/13	Fall	37:20	07:05	15°	20°00'N	40°23'E	1:3,333,000		J-6	132	0	GEOGRAPHY/CARTOGRAPHY: Saudia Arabia, Red Sea, Coast of Al Lith. (Normal) AGRICULTURE: Grazing. GEOLOGY/HYDROLOGY: Highly fractured igneous mountain region and an adjacent elevated desert plain. FORESTRY: Scattered low shrubform. OCEANOGRAPHY: Submerged land forms visible.
1614	24	10/13	Fall	37:21	07:28	20°	23°41'N	46°80'E			J-6	131	0	GEOGRAPHY/CARTOGRAPHY: Saudia Arabia, Jabel Tuwayq, south of Ar Riyad, Marrah. (Normal) AGRICULTURE: Nomadic herding. GEOLOGY/HYDROLOGY: Dissected sedimentary plateau and erg plain region. Dendritic drainage throughout the plateau. FORESTRY: Scattered low shrubform.
1615	24	10/13	Fall	37:23	08:04	26°	26°52'N	54°42'E	1:3,173,000		H-7	128	0	GEOGRAPHY/CARTOGRAPHY: Southern coast of Iran, Bandarte-Lengeh, Qishm Island, Qeys Island. (Normal) AGRICULTURE: Nomadic herding. GEOLOGY/HYDROLOGY: Highly folded region of anticlines with possible salt plug intrusions. FORESTRY: Grass and low scattered shrubform. OCEANOGRAPY: Sediment patterns from Rud-i-kul River.
1616	24	10/13	Fall	37:27	08:54	34°	28°55'N	66°17'E			H-8	127	0	GEOGRAPHY/CARTOGRAPHY: Pakistan, Kirthar and Makran Ranges, Quetta. (Normal) GEOLOGY/HYDROLOGY: Folded and fractured mountainous region. FORESTRY: Intermittent grasslands.
1617	24	10/13	Fall	37:31	10:08	43°	31°28'N	83°54'E	1:3,400,000		H-9	124		GEOGRAPHY/CARTOGRAPHY: Tibet, Nganglaring Tsho Lake, Tarok Tsho Lake. (Normal) GEOLOGY/HYDROLOGY: Complex hills and mountains of Tibet Plateau. METEOROLOGY: Cumulus, alto-cumulus.
1618	24	10/13	Fall										40	GEOGRAPHY/CARTOGRAPHY: Tibet, Himalayas. (Dark) GEOLOGY/HYDROLOGY: Complex mountainous region. METEOROLOGY: Cirrus, alto-cumulus.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1619	24	1968 10/13	Fall	34:40	12:55	50°	25°00'N	123°00'E*			H-12	125	60	GEOGRAPHY/CARTOGRAPHY: Ryukyu Island, Tarama, Irabu, Miyako. (Normal) GEOLOGY/HYDROLOGY: Marine coral deposits. METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Island atolls.
1620	25	"	Fall	38:48	06:51	11°	19°00'N	15°00'E*				134	0	GEOGRAPHY/CARTOGRAPHY: Niger, Grand Erg sand dunes. (Dark) GEOLOGY: Linear Seif Dune Plain Region of the Sahara.
1621	25	"	Fall	38:49	07:06	14°	19°55'N	18°32'E			J-4	133	0	GEOGRAPHY/CARTOGRAPHY: Chad, Tibesti Mountains, Emi Koussi volcano. (Dark) GEOLOGY/HYDROLOGY: Volcanic mountains of basalt in the Sahara.
1622	25	"	Fall	38:51	07:38	21°	23°00'N	26°00'E*				130	0	GEOGRAPHY/CARTOGRAPHY: United Arab Republic, Gilf Kebar Plateau. (Dark) GEOLOGY/HYDROLOGY: Sedimentary plateau elevated above the erg plains.
1623	25	"	Fall	38:53	08:10	26°	28°20'N	33°53'E			H-5	128	4	GEOGRAPHY/CARTOLOGY: Sinai Peninsula, Red Sea, Gulf of Suez, Gulf of Aqaba. (Normal) GEOLOGY/HYDROLOGY: Fractured mountainous granitic region, and coastal erg plains. OCEANOGRAPHY: Coral reef buildup and sedimentation along the coast.
1624	25	"	Fall	38:56	09:15	37°	29°00'N	49°00'E*			H-6	126	4	GEOGRAPHY/CARTOGRAPHY: Kuwait, Persian Gulf coast, Failaka Island. (Normal) AGRICULTURE: Dry land cultivation along coast. GEOLOGY/HYDROLOGY: Coastal Plain and sedimentation deposits. METEOROLOGY: Cumulus. OCEANOGRAPHY: Fresh-salt water interface, current patterns showing sediment flows, sun glint.
1625	25	"	Fall	39:03	11:58	53°	28°00'N	88°00'E*			H-9	124	5	GEOGRAPHY/CARTOGRAPHY: Nepal, Tibet, India, Ganges Plain. (Normal) GEOLOGY/HYDROLOGY: Mountainous region of basement complex bounded by a sedimentary plain. METEOROLOGY: Alto-cumulus.
1626	25	"	Fall	39:11	13:58	45°	23°00'N	116°00'E*			J12	126	70	GEOGRAPHY/CARTOGRAPHY: China, Han River, Shan-T'Oli. (Normal) AGRICULTURE: Irrigated subsistence. GEOLOGY/HYDROLOGY: Submerged coastline, dissected hills and mountains of complex structure. FORESTRY: Intermittent evergreen forests. METEOROLOGY: Cumulus, strato-cumulus. OCEANOGRAPHY: Fresh-salt water interfaces, sediment flow patterns.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1627	25	1968 10/13	Fall	39:14	14:22	42°	$19^{\circ}00'$N	$121^{\circ}22'$E	1:4,600,000		J-12	127	41	GEOGRAPHY/CARTOGRAPHY: Philippine Island, north Luzon coast, Babuyan Island, Luzon Strait. (Normal) GEOLOGY/HYDROLOGY: Complex hill structure and volcanic islands. FORESTRY: Scattered tropical hardwood forests. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Well developed beaches, some water tonal differences.
1628	33	"	Fall	52:32	12:01	52°	$26^{\circ}40'$N	$113^{\circ}40'$W*			H-22, 23	122	24	GEOGRAPHY/CARTOGRAPHY: Baja California, Gulf of California, western coast of Mexico. (Normal) GEOLOGY/HYDROLOGY: Coastal plain deposits and dissected hills and mountains. METEOROLOGY: Cumulus. OCEANOGRAPHY: Faint tonal changes.
1629	33	"	Fall	52:32	12:01	52°	$30^{\circ}00'$N	$116^{\circ}00'$N*			H-22	122	35	GEOGRAPHY/CARTOGRAPHY: Baja California, Bahia San Quintin. (Normal) AGRICULTURE: Cultivation patterns apparent along western coast. GEOLOGY/HYDROLOGY: Folded and basement complex hill and mountainous region. Intermittent dendritic drainage. FORESTRY: Scattered desert shrubform. METEOROLOGY: Cumulus, towering-cumulus. OCEANOGRAPHY: Tonal changes along eastern coast.
1630	33	"	Fall	52:33	12:06	52°	$28^{\circ}20'$N	$112^{\circ}40'$W*	1:3,700,000		H-22	122	0	GEOGRAPHY/CARTOGRAPHY: Baja California, Gulf of California, Mexico, Tiburon Island. (Normal) AGRICULTURE: Extensive cultivation along Sonora River delta. GEOLOGY/HYDROLOGY: Complex and volcanic hills and mountains, with coastal and alluvial plains. FORESTRY: Scattered desert shrubform. OCEANOGRAPHY: Current patterns along Mexican coast.
1631	33	"	Fall	52:33	12:06	52°	$28^{\circ}42'$N	$112^{\circ}20'$W	1:3,000,000		H-22	122	0	GEOGRAPHY/CARTOGRAPHY: West coast of Mexico, Gulf of California, Tiburan Island. AGRICULTURE: Extensive cultivation along Sonora River delta. GEOLOGY/HYDROLOGY: Deltaic, coastal and alluvial plains with complex hills distributed throughout. FORESTRY: Scattered desert shrubform. OCEANOGRAPHY: Sun glint showing surface currents.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1632	33	1968 10/13	Fall	52:33	12:06	52^{o}	$27^{o}30'N$	$111^{o}00'W$*			H-22	122	0	GEOGRAPHY/CARTOGRAPHY: Western Coast of Mexico, Gulf of California. (Normal) AGRICULTURE: Extensive cultivation along coast, prominent field patterns. GEOLOGY/HYDROLOGY: Deltaic coastal plains and complex hills and mountains. FORESTRY: Scattered desert shrubform, with evergreens at higher elevations. OCEANOGRAPHY: Prominent sun glint revealing surface current patterns.
1633	33	"	Fall	52:35	13:49	51^{o}	$24^{o}45'N$	$97^{o}30'W$	1:2,920,000		H-23 J-24	123	47	GEOGRAPHY/CARTOGRAPHY: Mexico, Lower Texas Gulf Coast, Laguna Madre, Gulf of Mexico, San Fernando. (Normal) AGRICULTURE: Extensive cultivation along northern coast. GEOLOGY/HYDROLOGY: Shoreline of emergence with an offshore bar and lagoon. FORESTRY: Scattered to dense shrubform, coastal grasses. METEOROLOGY: Cumulus, towering cumulus. OCEANOGRAPHY: Well developed beaches, inner coastal lagoon depths evident by color contrast. Some offshore current patterns apparent.
1634	33	"	Fall	52:35	13:49	51^{o}	$24^{o}20'N$	$97^{o}30'W$	1:3,300,000		H-23 J-24	123	35	GEOGRAPHY/CARTOGRAPHY: Mexico, Leguna Madre, Leguna de Morales, Soto la Marina River, Gulf Coast. (Normal) AGRICULTURE: Isolated field patterns, primarily along Soto River and coast. GEOLOGY/HYDROLOGY: Shoreline of emergence with an offshore bar and lagoon. FORESTRY: Coastal grasses with scattered shrubform. METEOROLOGY: Cumulus. OCEANOGRAPHY: Well developed beaches, sun glint exposing surface wave and current patterns.
1635	33	"	Fall	52:37	13:50	48^{o}	$21^{o}24'N$	$89^{o}12'W$	1:4,560,000		J-15	123	40	GEOGRAPHY/CARTOGRAPHY: Mexico, northern coast of Yucatan, Merida, Gulf of Mexico, Progreso. (Normal) AGRICULTURE: Extensive cultivation patterns along coast at Progreso and inland to Merida. GEOLOGY/HYDROLOGY: Emerged coastline and coastal plain deposits. FORESTRY: Grasses with scattered shrubform. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Some surface current activity apparent along coast.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1636	33	1968 10/13	Fall	52:37	13:50	48°	21°30'N	89°40'W*			J-25	123	40	GEOGRAPHY/CARTOGRAPHY: Mexico, northern coast of Yucatan, Merida, Gulf of Mexico. (Normal) AGRICULTURE: Extensive field pattern development along coast. GEOLOGY/HYDROLOGY: Emerged coastline and coastal plain deposits. FORESTRY: Grasses and low shrubform. METEOROLOGY: Cumulus, cumulo-nimbus. OCEANOGRAPHY: Partial sun glint revealing offshore wave or current activity.
1637	33	"	Fall	52:38	13:52	47°	20°41'N	87°20'W			J-25	123	90	GEOGRAPHY/CARTOGRAPHY: Mexico, northeastern tip of Yucatan, Puerto Juarez. (Normal) GEOLOGY/HYDROLOGY: Emerged coastline and coastal plain. FORESTRY: Dense shrubform with large open areas near coast. METEOROLOGY: Cumulus, towering cumulus, cirrus.
1638	34	"	Cool-Dry	52:42	14:46	38°	12°17'N	72°04'W	1:5,100,000		K-26	128	38	GEOGRAPHY/CARTOGRAPHY: Columbia, Venezuela, Peninsula de Guajira, Gulf of Venezuela, Maracaibo. (Normal) GEOLOGY/HYDROLOGY: Sedimentary coastal plain with complex and folded hills. FORESTRY: Dense tropical forests inland. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Some sediment patterns in Gulf of Venezuela.
1639	34	"	Cool-Dry	52:42	15:00	38°	12°15'N	71°30'W	1:3,110,000		K-26	128	25	GEOGRAPHY/CARTOGRAPHY: Columbia, Venezuela, Peninsula de Guajira. (Normal) GEOLOGY/HYDROLOGY: Sedimentary coastal plain with complex and folded hills. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Some color change.
1640	34	"	Cool-Dry	52:43	15:05	37°	12°03'N	70°13'W	1:3,750,000		K-26	128	30	GEOGRAPHY/CARTOGRAPHY: Venezuela, Peninsula de Paraguana, Islands of Aruba and Curacao. (Normal) GEOLOGY/HYDROLOGY: Coastal plain region. FORESTRY: Dense to semi-dense stands on mainland. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Some wave activity along beaches.
1641	34	"	Cool-Dry	52:43	15:05	36°	10°25'N	68°29'W			K-27	129	50	GEOGRAPHY/CARTOGRAPHY: Venezuela coastline, Gulf of Triste, Valencia. (Normal) AGRICULTURE: Field patterns evident in lowlands of interior. GEOLOGY/HYDROLOGY: Coastal plain and complex mountain region. FORESTRY: Dense tropical forests in upper peninsula. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Sediment patterns along interface.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINCIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1642	34	1968 10/13	Cool-Dry	52:44	15:31	32°	11°00'N	64°00'W	1:6,510,000		K-27	129	14	GEOGRAPHY/CARTOGRAPHY: Venezuela coast, Peninsula de Araya, Barcelona, De Margarita Island. (Normal) GEOLOGY/HYDROLOGY: Submerged coastline and coastal plain. FORESTRY: Dense tropical rainforest grading to shrub-form. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Some tonal change.
1643	34	"	Cool-Dry	52:44	15:31	33°	8°05'N	64°15'W	1:4,100,000		K-27 L-27	130	35	GEOGRAPHY/CARTOGRAPHY: Venezuela, Orinoco River, Cuidad Bolivar, El Tigre. (Normal) AGRICULTURE: Isolated field patterns near El Tigre. GEOLOGY/HYDROLOGY: Sedimentary plateau, flood plain and meandering perennial drainage. FORESTRY: Isolated dense forest stands, primarily along Orinoco River and tributaries. METEOROLOGY: Cumulus.
1644	34	"											95	CLOUDS: Strato-cumulus. (Normal)
1645	34	"	Fall	54:07	13:38	45°	26°00'N	113°00'W*			H-22	123	10	GEOGRAPHY/CARTOGRAPHY: Baja California. (Normal) GEOLOGY/HYDROLOGY: Alluvial and low plains. Complex mountains in the foreground. METEOROLOGY: Small-cumulus.
1646	34	"	Fall	54:07	13:38	46°	23°00'N	111°00'W*			H-22	123	20	GEOGRAPHY/CARTOGRAPHY: Baja California. (Normal) GEOLOGY/HYDROLOGY: Low plains region. METEOROLOGY: Cumulus, alto-cumulus.
1647	34	"	Fall	54:09	14:08	43°	21°00'N	106°00'W*			J-24	124	54	GEOGRAPHY/CARTOGRAPHY: Mexico, Puerto Vallarta. (Normal) GEOLOGY/HYDROLOGY: Coastal plain region. FORESTRY: Semi-dense forest stands in the southern boundary grading to isolated shrubform to the north. METEOROLOGY: Cumulus, cirrus.
1648	34	"	Fall	54:09	14:08	43°	19°30'N	104°50'W	1:3,840,000		J-24	124	46	GEOGRAPHY/CARTOGRAPHY: Mexico, Puerto Vallarta to Manzanillo. (Normal) GEOLOGY/HYDROLOGY: Coastal plain and dissected hills region. FORESTRY: Semidense forest stands changing to dense stands along drainage. METEOROLOGY: Cumulus, towering-cumulus, alto-cumulus, cirrus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	% CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1649	34	1968 10/13	Fall	54:09	14:08	42°	17°38'N	101°58'W	1:3,840,000		J-24		15	GEOGRAPHY/CARTOGRAPHY: Mexico, Bahia de Petacalco. (Normal) GEOLOGY/HYDROLOGY: Basement complex of Sinai Madre and elevated coastal plain. FORESTRY: Semidense to open forests with dense vegetation along major drains. METEOROLOGY: Small cumulus, alto-cumulus. OCEANOGRAPHY: Excellent fresh-salt water interface with definite sediment flow patterns.
1650	34	"	Fall	54:10	14:27	42°	17°37'N	101°30'W	1:3,320,000		J-24	125	17	GEOGRAPHY/CARTOGRAPHY: Mexico, West Coast, Bahia de Petacalco. (Normal) GEOLOGY/HYDROLOGY: Basement complex of the Sierra Madre Del Sur with intermittent and perennial drainage. FORESTRY: Semidense to open forests with dense vegetation along drains. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Excellent fresh-salt water interface with definite sediment flow patterns.
1651	34	"	Fall	54:10	14:27	42°	17°10'N	100°25'W	1:3,320,000		J-24	125	32	GEOGRAPHY/CARTOGRAPHY: Mexico, West Coast, Acapulco. (Normal) GEOLOGY/HYDROLOGY: Complex mountains and perennial drainage flowing toward the Coastal Plain region. FORESTRY: Scattered low shrubform. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Sediment flows showing offshore currents.
1652	34	"	Fall	54:10	14:27	42°	16°45'N	99°17'W	1:3,390,000		J-24	125	50	GEOGRAPHY/CARTOGRAPHY: Mexico, west coast, Acapulco to Tecuanapa. (Normal) GEOLOGY/HYDROLOGY: Coastal plain region with adjacent complex and dissected hills. FORESTRY: Scattered low shrubform with intermittent forest stands. METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Fresh-salt water interface showing sediment flows.
1653														BLANK.
1654	36	"	Fall	56:45	07:40	21°	24°00'N	118°00'E*				131	75	GEOGRAPHY/CARTOGRAPHY: China Coast near Quemoy Island. (Dark) GEOLOGY/HYDROLOGY: Shoreline of submergence with coastal sedimentation. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Some sediment transports.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1655	36	1968 10/13	Fall	56:45	07:40	21°	24°20'N	118°30'E*				131	70	GEOGRAPHY/CARTOGRAPHY: China Coast near Quemoy Island. (Dark) GEOLOGY/HYDROLOGY: Shoreline of submergence. METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Some sediment transports.
1656	38	10/14	Fall	59:40									5	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Empty Quarter sand dunes. (Light)
1657	38	"	Fall	59:40	06:19	05°	22°00'N	54°00'E*				136	25	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Trucial States, Coast of Abu Dhabi. (Light) GEOLOGY/HYDROLOGY: Erg plains of seif dunes.
1658	38	10/14	Fall	59:41	06:42	10°	22°19'N	59°50'E			J-7	135	10	GEOGRAPHY/CARTOGRAPHY: Muscat and Oman, Oman Ranges. (Light) GEOLOGY/HYDROLOGY: Coastal mountain complex and interior desert plains of seif dunes. METEOROLOGY: Cumulus.
1659	38	10/14	Fall	59:42	06:45	09°	24°00'N	60°00'E*			J-7	135	5	GEOGRAPHY/CARTOGRAPHY: Muscat and Oman, Oman Ranges, Coast of Iran. (Light) GEOLOGY/HYDROLOGY: Coastal mountain complex. METEOROLOGY: Cumulus.
1660	38	10/14	Fall	59:44	07:15	14°	32°00'N	67°00'E*				132	15	GEOGRAPHY/CARTOGRAPHY: Pakistan, Kirthar and Makran Ranges, Indus River. (Normal) GEOLOGY/HYDROLOGY: Complex anticlinorium folding.
1661	38	10/14	Fall	59:44	07:15	15°	25°00'N	66°58'E	1:3,200,000		H-8	132		GEOGRAPHY/CARTOGRAPHY: Pakistan, Karachi and Indus River. (Light) GEOLOGY/HYDROLOGY: Perennial deltaic flood plain and sedimentary folded and horizontal beds. FORESTRY: Scattered shrubform changing to dense vegetation in delta. OCEANOGRAPHY: Fresh-salt water interface with sediment patterns showing current directions.
1662	38	10/14	Fall	59:55	10:26	44°	31°52'N	111°56'E	1:3,000,000		G-9 H-11	124	20	GEOGRAPHY/CARTOGRAPHY: China, Han River Area. Fanch Eng. (Normal) GEOLOGY/HYDROLOGY: Alluvial flood plain, and sedimentary and complex mountain structure. FORESTRY: Isolated shrubform. METEOROLOGY: Cirrus, cumulus.
1663	38	10/14	Fall	59:56	10:59	43°	36°00'N	120°00'E*			G-10 H-12	123	25	GEOGRAPHY/CARTOGRAPHY: China, Shantung Peninsula, Yellow Sea, Korea Bay. (Light) METEOROLOGY: Cirrus, cumulus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1664	38	1968 10/14	Fall	59:59	11:42	50°	$31^{\circ}30'$N	$130^{\circ}00'$E*			H-13	122	90	GEOGRAPHY/CARTOGRAPHY: Southern tip of Japan. (Light) METEOROLOGY: Cirrus, alto-cumulus, cumulus.
1665	38	10/14	Fall										55	GEOGRAPHY/CARTOGRAPHY: Two small islands. (Light) METEOROLOGY: Cumulus.
1666	39	10/14	Fall	61:12	06:43	10°	$21^{\circ}23'$N	$36^{\circ}51'$E	1:2,900,000		J-6	133	20	GEOGRAPHY/CARTOGRAPHY: Sudan, Red Sea, Coast at Ras Abu Shajarah. (Light) GEOLOGY/HYDROLOGY: Highly fractured sedimentary and igneous mountain complex, coastal plain and intermittent drainage. FORESTRY: Shrubform and grasses. METEOROLOGY: Cumulus. OCEANOGRAPHY: Offshore, subsurface topography visible.
1667	39	10/14	Fall	61:20	08:52	31°					H-8		0	GEOGRAPHY/CARTOGRAPHY: Afghanistan, Kabul, Panjshir River, Kah-i-Baba Mountains. (Normal) GEOLOGY/HYDROLOGY: Folded mountain complex and intermittent drainage.
1668	40	10/14	Cool-Dry				$14^{\circ}55'$N	$121^{\circ}18'$E			K-11		80	GEOGRAPHY/CARTOGRAPHY: Philippine Islands, Manila. (Dark) METEOROLOGY: Cumulus, towering cumulus, cirrus.
1669	40	10/14	Cool-Dry	63:08	14:33	43°	$12^{\circ}16'$N	$125^{\circ}20'$E			K-11	125	80	GEOGRAPHY/CARTOGRAPHY: Philippine Islands, northern coast of Samar. (Dark) METEOROLOGY: Cumulus, cirrus.
1670	40	10/14	Hot-Wet										60	GEOGRAPHY/CARTOGRAPHY: North of Solomon Islands. (Dark) METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Circular reefs.
1671	40	10/14											50	CLOUDS: Cumulus, towering cumulus, cirrus. (Dark)
1672	41	10/14	Fall	64:33	13:24	50°	$21^{\circ}30'$N	$87^{\circ}00'$E*				122	0	GEOGRAPHY/CARTOGRAPHY: India, mouth of Hooghly River, Bay of Bengal. (Dark)
1673	41	10/14	Fall	64:34	13:29	50°	$21^{\circ}40'$N	$88^{\circ}00'$E*				122	0	GEOGRAPHY/CARTOGRAPHY: India, mouth of Hooghly River, Bay of Bengal. (Dark)
1674	41	10/14	Fall	64:34	13:34	49°	$21^{\circ}30'$N	$88^{\circ}40'$E*				122	0	GEOGRAPHY/CARTOGRAPHY: India, Pakistan, mouth of Haringata River, Bay of Bengal. (Dark)
1675	41	10/14	Fall	64:34	13:38	48°	$21^{\circ}58'$N	$90^{\circ}20'$E			J-10	122	28	GEOGRAPHY/CARTOGRAPHY: Burma, Pakistan, mouth of Ganges River, Bay of Bengal. (Dark) METEOROLOGY: Cumulus, cirrus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1676	41	1968 10/14	Fall	64:35	13:46	47°	21°00'E	92°00'E*			J-10	122	35	GEOGRAPHY/CARTOGRAPHY: Burma, Pakistan, Cox's Bazar. (Dark) METEOROLOGY: Cumulus, cirrus.
1677	41	10/14	Fall	64:35	13:48	47°	20°00'N	92°30'E*				122	25	GEOGRAPHY/CARTOGRAPHY: Burma, Bay of Bengal, coast of Akyab. (Dark) METEOROLOGY: Cumulus.
1678	41	10/14	Fall	64:35	13:52	47°	18°40'N	92°30'E*				123	13	GEOGRAPHY/CARTOGRAPHY: Burma, Bay of Bengal, Cheduba Island. (Dark) METEOROLOGY: Cumulus, cirrus.
1679	41	10/14	Fall	64:36	13:56	47°	18°20'N	94°20'E*				123	50	GEOGRAPHY/CARTOGRAPHY: Burma, Bay of Bengal, Cheduba Island, Andren Bay. (Dark) METEOROLOGY: Cumulus, towering cumulus, cirrus.
1680	41	10/14	Fall	64:36	14:04	47°	16°27'N	96°15'E				124	38	GEOGRAPHY/CARTOGRAPHY: Burma, Rangoon, Hlaing River. (Dark) METEOROLOGY: Cumulus OCEANOGRAPHY: Sediment pattern from river mouth.
1681	41	10/14	Cool-Dry	64:38	14:43	41°	13°30'N	105°30'E*				126	100	GEOGRAPHY/CARTOGRAPHY: Cambodia, Mekong River near Stung Treng. (Dark) METEOROLOGY: Cumulus, towering cumulus, cirrus.
1682	41	10/14											95	METEOROLOGY: Cumulus, strato-cumulus, cirrus. (Dark)
1683	41	10/14											90	METEOROLOGY: Towering cumulus, cirrus. (Dark)
1684	41	10/14											80	METEOROLOGY: Cumulus, cirrus. (Dark)
1685	41	10/14											50	METEOROLOGY: Cumulus, cirrus. (Dark)
1686													40	METEOROLOGY: Cumulus, cirrus. (Dark)
1687	41	10/14											20	METEOROLOGY: Cumulus, cirrus. (Dark)
1688	41	10/14											100	METEOROLOGY: Cumulus, alto-cumulus, cirrus. (Dark)
1689	41	10/14											50	METEOROLOGY: Cumulus, cirrus. (Dark)
1690	41	10/14											0	BLANK
1691	41	10/14											0	BLANK
1692 -	42	10/14	Fall	65:46	09:41	25°	27°00'N	13°00'E*				129	0	GEOGRAPHY/CARTOGRAPHY: Morocco, coast near Ifni, horizon. (Light)

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1693	42	1968 10/14	Fall	65:59	10:59	48°	31°23'N	30°38'E			H-5	124	33	GEOGRAPHY/CARTOGRAPHY: Nile Delta, Alexandria to Port Said. (Dark) AGRICULTURE: Extensive cultivation in Nile Delta area. GEOLOGY/HYDROLOGY: Deltaic flood plain and a lower coastal plain. Perennial drainage is dominant within the delta. FORESTRY: Scattered shrubform outside of agriculture patterns. METEOROLOGY: Cumulus, towering cumulus.
1694	42	10/14	Fall	65:54	10:59	51°	30°12'N	32°09'E	1:4,930,000		H-5	124	27	GEOGRAPHY/CARTOGRAPHY: Nile Delta, Gulf of Suez. (Dark) GEOLOGY/HYDROLOGY: Erg and alluvial plains with highly fractured complex mountains. Intermittent drainage dominates. FORESTRY: Scattered shrubform. METEOROLOGY: Cumulus. OCEANOGRAPHY: Submerged coastline in Gulf of Suez.
1695	42	10/14	Fall	65:55	10:59	55°	29°21'N	32°50'E	1:4,100,000		H-5 J-6	124	7	GEOGRAPHY/CARTOGRAPHY: Gulf of Suez, Red Sea, Gulf of Aqaba. (Dark) GEOLOGY/HYDROLOGY: Elevated erg plains with fractured basement complex mountains. Intermittent drainage dominates. FORESTRY: Scattered shrubform and desert grasses. METEOROLOGY: Cumulus. OCEANOGRAPHY: Submerged coastline visible in Gulf of Suez.
1696	42	10/14	Fall	65:55	11:13	49°	30°59'N	33°55'E	1:4,000,000		H-5	124	13	GEOGRAPHY/CARTOGRAPHY: Mediterranean Sea, Israel, Dead Sea. (Dark) GEOLOGY/HYDROLOGY: Coastal plain and fractured sedimentary hills and mountains. FORESTRY: Scattered shrubform and desert grasses. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Inland salt water bodies along coast.
1697	42	10/14	Fall	65:55	11:16	52°	28°15'N	34°25'E	1:5,700,000		H-5	124	10	GEOGRAPHY/CARTOGRAPHY: Sinai Peninsula, Red Sea, Gulf of Aqaba. (Dark) GEOLOGY/HYDROLOGY: Fractured mountain complex with dendritic intermittent drainage. FORESTRY: Desert shrubform. METEOROLOGY: Cumulus. OCEANOGRAPHY: Coral visible in Strait of Gubal.
1698	42	10/14	Fall	65:56	11:21	49°	31°28'N	35°45'E	1:4,500,000		H-5	123	1	GEOGRAPHY/CARTOGRAPHY: Israel, Dead Sea, Jordan. (Dark) GEOLOGY/HYDROLOGY: Fractured mountain complex with intermittent drainage. FORESTRY: Desert shrubform. METEOROLOGY: Cirrus.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1699	42	1968 10/14	Fall	65:58	12:17	50°	$30^{\circ}02'$N	$48^{\circ}54'$E	1:7,800,000		H-6	121	3	GEOGRAPHY/CARTOGRAPHY: Persian Gulf, Kuwait, mouth of Tigris-Euphrates Rivers. (Dark) AGRICULTURE: Scattered field patterns along rivers. GEOLOGY/HYDROLOGY: Deltaic flood plain region. FORESTRY: Desert shrubform primarily along banks of major drains. METEOROLOGY: Small cumulus. OCEANOGRAPHY: Good fresh-salt water interface, showing sediment patterns.
1700	42	10/14	Fall	65:58	12:21	49°	$31^{\circ}04'$N	$49^{\circ}40'$E	1:6,900,000		H-6 H-7	121	7	GEOGRAPHY/CARTOGRAPHY: Persian Gulf, Iran, Iraq, mouth of Tigris-Euphrates Rivers. (Dark) AGRICULTURE: Field patterns along Karun Rud River. GEOLOGY/HYDROLOGY: Alluvial flood plain, delta, and complex folded mountains. METEOROLOGY: Cumulus. OCEANOGRAPHY: Sediment flow patterns from rivers.
1701	42	10/14	Fall	66:00	12:29	52°	$28^{\circ}03'$N	$51^{\circ}45'$E	1:3,860,000		H-6 H-7	121	0	GEOGRAPHY/CARTOGRAPHY: Persian Gulf, Iran, coast of Kangan, Zagros Mountains. (Dark) AGRICULTURE: Possible cultivation patterns along avenues of drainage near Lake Daryachehi. GEOLOGY/HYDROLOGY: Folded sedimentary mountain region with an intermittent drainage system. FORESTRY: Grass and scattered desert shrub. OCEANOGRAPHY: Sediment flow patterns along coast.
1702	42	10/14	Fall	66:01	12:40	52°	$27^{\circ}09'$N	$54^{\circ}02'$E	1:3,590,000		H-7	121	1	GEOGRAPHY/CARTOGRAPHY: Persian Gulf, Iran, coast south of Lar, Zagros Mountains. (Dark) AGRICULTURE: Cultivation patterns visible near town of Rizak. GEOLOGY/HYDROLOGY: Folded sedimentary mountain region. FORESTRY: Grass and scattered desert shrub. METEOROLOGY: Cumulus. OCEANOGRAPHY: Some color change.
1703	42	10/14	Fall	66:01	12:48	51°	$26^{\circ}58'$N	$56^{\circ}03'$E	1:4,000,000		H-7	121	1	GEOGRAPHY/CARTOGRAPHY: Gulf of Oman, Iran, Qishm Island. (Dark) GEOLOGY/HYDROLOGY: Folded mountains, salt plugs, and a submerged delta region. FORESTRY: Grass and scattered desert shrubform. METEOROLOGY: Cumulus. OCEANOGRAPHY: Sediment deposits along coast, channels off island of Qishm very distinctive.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1704	42	1968 10/14	Fall	66:02	13:13	50°	$25^{\circ}26'$N	$62^{\circ}01'$E	1:5,000,000		H-7 H-8	121	0	GEOGRAPHY/CARTOGRAPHY: Arabian Sea, Iran, Pakistan, Makran Ranges. (Dark) GEOLOGY/HYDROLOGY: Alluvial coastal plain and complex sedimentary folded mountain ranges. FORESTRY: Scattered desert shrubform and grass. OCEANOGRAPHY: Fresh-salt water interface.
1705	42	10/14	Fall	66:05	13:44	47°	$22^{\circ}20'$N	$69^{\circ}00'$E	1:4,900,000		J-8	122	10	GEOGRAPHY/CARTOGRAPHY: India, Gulf of Kutch, Jamnagar. (Dark) GEOLOGY/HYDROLOGY: Low flood plain area of low hills and salt marshes. FORESTRY: Scattered to dense shrubform, mostly mangrove. METEOROLOGY: Cumulus. OCEANOGRAPHY: Possible sediment flows or subsurface topography visible.
1706	42	10/14	Fall	66:06	14:01	45°	$21^{\circ}00'$N	$73^{\circ}00$E*			J-8	122	35	GEOGRAPHY/CARTOGRAPHY: India, Gulf of Cambay. (Dark) METEOROLOGY: Cumulus, alto-cumulus.
1707	42	10/14	Hot-Wet	66:17	17:12	09°	$08^{\circ}40'$N	$118^{\circ}10'$E*				137	40	GEOGRAPHY/CARTOGRAPHY: Somewhere in Indonesia. (Dark) METEOROLOGY: Cumulus, cirrus.
1708	42	10/14	Hot-Wet	66:17	17:24	07°	$09^{\circ}30'$N	$121^{\circ}00'$E*				137	60	GEOGRAPHY/CARTOGRAPHY: Indonesia, east end of Sumba Island. (Dark) METEOROLOGY: Cumulus, cirrus.
1709	42	10/14												METEOROLOGY: Small cumulus. (Dark)
1710	42	10/14											60	METEOROLOGY: Cumulus, dense cirrus. (Dark)
1711	42	10/14											75	METEOROLOGY: Cumulus, strato-cumulus, some cirrus. (Dark)
1712	43	10/14	Fall	67:35	14:16	44°	$16^{\circ}54'$N	$54^{\circ}41'$E			J-7	124	20	GEOGRAPHY/CARTOGRAPHY: Muscat-Oman, Arabian Sea, Coast of Salalah. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region with numerous wadis. METEOROLOGY: Cumulus, cumulo-nimbus.
1713	44	10/14	Fall	68:53	10:52	50°	$29^{\circ}10'$N	$16^{\circ}25'$W	1:6,000,000		H-1	124	35	GEOGRAPHY/CARTOGRAPHY: Canary Islands, African coast in background. (Dark) GEOLOGY/HYDROLOGY: Volcanic islands and coastal plain desert region. METEOROLOGY: Small cumulus.
1714	44	10/14	Fall	68:53	10:54	52°	$28^{\circ}30'$N	$13^{\circ}30'$W*			H-1	124	25	GEOGRAPHY/CARTOGRAPHY: Canary Islands, African coast in background. (Dark) GEOLOGY/HYDROLOGY: Low erg coastal plain. METEOROLOGY: Strato-cumulus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1715	44	1968 10/14	Fall	68:53	10:56	52°	27°00'N	15°00'W*			H-1	124	13	GEOGRAPHY/CARTOGRAPHY: Canary Islands, African coast in background. (Dark) GEOLOGY/HYDROLOGY: Low erg coastal plain. METEOROLOGY: Strato cumulus.
1716	44	"	Fall	68:54	11:03	52°	27°26'N	14°05'W			H-1	124	8	GEOGRAPHY/CARTOGRAPHY: Canary Islands, Fuerteventura Island Coast of Spanish Sahara in background. (Dark) GEOLOGY/HYDROLOGY: Island of complex hills and mountains, erg coastal plain with numerous wadis and dry lakes. FORESTRY: Dense tropical forests. METEOROLOGY: Cumulus. OCEANOGRAPHY: Surface patterns visible near islands.
1717	44	"	Cool-Dry	69:07	10:01	43°	13°48'N	33°22'E	1:3,200,000		K-5	124	30	GEOGRAPHY/CARTOGRAPHY: Africa, Sudan, Blue and White Nile, South of Khartoum AGRICULTURE: Extensive cultivation, field patterns and irrigation system easily discernable. GEOLOGY/HYDROLOGY: Interior elevated alluvial flood-plain. FORESTRY: Tall savanna intermixed with groups of sub-tropical hardwoods. METEOROLOGY: Cumulus, cumulo-nimbus.
1718	44	"	Cool-Dry	69:07	09:58	43°	13°44'N	35°56'E	1:2,900,000		K-5	124	22	GEOGRAPHY/CARTOGRAPHY: Africa, Sudan, Blue and White Nile, South of Khartoum. (Dark) AGRICULTURE: Extensive cultivation, field patterns and irrigation system easily discernable. GEOLOGY/HYDROLOGY: Interior elevated alluvial flood-plain. FORESTRY: Tall savanna, intermixed with groups of sub-tropical hardwoods. METEOROLOGY: Cumulus.
1719	44	"	Cool-Dry	69:08	09:42	42°	11°45'N	37°28'E	1:3,760,000		K-5	125	40	GEOGRAPHY/CARTOGRAPHY: Africa, Ethiopia, Lake Tana. (Dark) GEOLOGY/HYDROLOGY: Drainage basin in a mountainous region. METEOROLOGY: Cumulus, part of cumulo-nimbus.
1720	45	"	Fall	71:45	08:24	28°	29°01'N	95°29'W	1:4,130,000		H-24	125	37	GEOGRAPHY/CARTOGRAPHY: Texas Gulf Coast, Galveston to Corpus Christi. (Normal) AGRICULTURE: Extensive cultivation, irrigated, grazing. GEOLOGY/HYDROLOGY: Coastal plain region with a shore-line of emergence. FORESTRY: Mixed hardwood-conifer forests changing to grass and shrubform along coast. METEOROLOGY: Cumulus, strato-cumulus. OCEANOGRAPHY: Excellent sediment flows into Gulf from Texas rivers, indicating offshore currents.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1721	45	1968 10/14	Fall	71:45	08:26	28°	28°50'N	96°08'W			H-24	125	30	GEOGRAPHY/CARTOGRAPHY: Texas Gulf Coast, Beaumont to Corpus Christi. (Normal) AGRICULTURE: Extensive cultivation, irrigated, grazing. GEOLOGY/HYDROLOGY: Coastal plain region with a shoreline of emergence. FORESTRY: Mixed hardwood-conifer forests changing to grass. METEOROLOGY: Cumulus, strato-cumulus. OCEANOGRAPHY: Excellent sediment flows into Gulf from rivers, Galveston Bay.
1722	45	"	Fall	71:47	09:02	34°	30°58'N	87°11'W			H-24	124	1	GEOGRAPHY/CARTOGRAPHY: Mobile, Alabama. Pensacola, Florida. (Normal) AGRICULTURE: Field patterns near Pensacola. GEOLOGY/HYDROLOGY: Gulf coastal plain of sedimentary bed. FORESTRY: Mixed conifer-hardwood forests. METEOROLOGY: Small scattered cumulus.
1723	45	"	Fall	71:48	09:25	38°	31°32'N	81°31'W	1:3,800,000		H-23	124	30	GEOGRAPHY/CARTOGRAPHY: Georgia coast. Savannah. (Normal) AGRICULTURE: Extensive cultivation, scattered definable field patterns. GEOLOGY/HYDROLOGY: Atlantic Coastal Plain with a shoreline of emergence and perennial drainage inland. FORESTRY: Mixed conifer-hardwood, dense hardwood growth in bottom lands. OCEANOGRAPHY: Fresh-salt water interfaces with an abundance of sediment flows.
1724	45	"	Fall	71:48	09:27	38°	32°28'N	81°19'W	1:3,660,000		G-21 H-23	123	10	GEOGRAPHY/CARTOGRAPHY: Georgia coast. Savannah. (Normal) AGRICULTURE: Extensive cultivation, but scattered definable field patterns. GEOLOGY/HYDROLOGY: Atlantic Coastal Plain and shoreline of emergence. FORESTRY: Mixed conifer-hardwood, dense hardwood growth in bottomlands. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Fresh-salt water interfaces with an abundance of sediment flows.
1725	45	"	Fall	71:49	09:30	38°	32°37'N	80°39'W	1:4,200,000		G-21 H-23	123	15	GEOGRAPHY/CARTOGRAPHY: Georgia and South Carolina coasts. Savannah, Charleston. (Normal) AGRICULTURE: Extensive cultivation, scattered definable field patterns. GEOLOGY/HYDROLOGY: Atlantic coastal plain and shoreline of emergence. FORESTRY: Mixed conifer-hardwoods, dense hardwood growth in bottomlands.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Fresh-salt water interfaces showing sediment flow.
1726	45	10/14	Fall	71:49	0930	38°	32°22'N	80°40'W	1:4,600,000		G-21 H-23	123	15	GEOGRAPHY/CARTOGRAPHY: South Carolina-Georgia coast. Savannah, Charleston. (Normal) GEOLOGY/HYDROLOGY: Atlantic Coastal Plain and shoreline of emergence. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Fresh-salt water interface, showing sediment
1727	45	"											75	METEOROLOGY: Cumulus, alto-cumulus. (Normal)
1728	45	"											75	METEOROLOGY: Cumulus, alto-cumulus. (Normal)
1729	45	"											80	METEOROLOGY: Cumulus, alto-cumulus. (Dark)
1730	45	"											80	METEOROLOGY: Cumulus, alto-cumulus. (Dark)
1731	47	"	Fall	73:16	09:17	38°	28°41'N	112°51'W	1:4,800,000		H-22	126	20	GEOGRAPHY/CARTOGRAPHY: West coast of Mexico, Gulf of Baja California, Pacific Ocean. (Dark) AGRICULTURE: Extensive area of cultivation along west coast of Mexico. GEOLOGY/HYDROLOGY: Basement complex mountains and elevated alluvial plains. METEOROLOGY: Cirrus, cumulus. OCEANOGRAPHY: Some tonal changes.
1732	47	"	Fall	74:53	11:07	52°	28°05'N	102°20'W	1:5,100,000		H-23	124	30	GEOGRAPHY/CARTOGRAPHY: Mexico, Torreon, Sierra Madre Mountains. (Dark) AGRICULTURE: Cultivation sparse, field patterns discernable near town of Torreon. GEOLOGY/HYDROLOGY: Folded and complex mountain region with intermittent drainage. FORESTRY: Desert shrubform changing to dwarf evergreen at higher elevations. METEOROLOGY: Cumulus.
1733	48	"	Fall	74:58	12:39	54°	25°10'N	80°33'W			H-25	121	60	GEOGRAPHY/CARTOGRAPHY: United States, Miami, Florida Keys, Florida Straits. (Dark) AGRICULTURE: Field patterns near Miami. GEOLOGY/HYDROLOGY: Atlantic Coastal Plain. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Great Bahama Bank in background.
1734	48	"		74:58	12:48	53°	28°00'N	78°20'W*			H-25	121	50	GEOGRAPHY/CARTOGRAPHY: Bahamas, Andros Island, Williams Island. (Normal) METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Great Bahama Bank.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1735	48	10/14	Fall	75:00	13:19	52°	18°10'N	70°57'W	1:5,200,000		J-27	122	85	GEOGRAPHY/CARTOGRAPHY: Dominican Republic, Santo Domingo. (Dark) METEOROLOGY: Towering cumulus, cirrus. OCEANOGRAPHY: Some tonal change.
1736	48	10/14	Fall	75:01	13:26	52°	18°40'N	69°36'W	1:3,850,000		J-27	122	75	GEOGRAPHY/CARTOGRAPHY: Dominican Republic. (Dark) AGRICULTURE: Field patterns visible along southern coast. GEOLOGY/HYDROLOGY: Coastal plain region showing perennial drainage. METEOROLOGY: Towering cumulus, cirrus. OCEANOGRAPHY: Sun-glint near Santo Domingo.
1737	48	10/14	Fall	75:01	13:29	52°	18°00'N	68°45'W*				123	75	GEOGRAPHY/CARTOGRAPHY: Dominican Republic, La Romana, Saona Island. (Dark) AGRICULTURE: Some field patterns visible. GEOLOGY/HYDROGOLOGY: Coastal plain region. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Sun-glint.
1738	51	10/14	Fall	80:56		53°						121	35	GEOGRAPHY/CARTOGRAPHY: Gardiner's Pinnacles.(Normal) METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Shoal area.
1739	51	10/14		80:57		53°						121	40	GEOGRAPHY/CARTOGRAPHY: Pacific Ocean. (Normal) METEOROLOGY: Cumulus, alto-cumulus, cirrus.
1740	51	10/15	Fall	80:58	10:41	50°	23°00'N	160°30W*		599		122	33	GEOGRAPHY/CARTOGRAPHY: Island of Niihau in Hawaiian Chain, the Northeastern most island. (Normal) GEOLOGY/HYDROLOGY: Volcanic mountains. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Island beaches.
1741	51	10/15	Fall	80:59	10:32	50°	23°00'N	158°30W*		599		122	25	GEOGRAPHY/CARTOGRAPHY: Island of Oahu, Hawaii, City of Honolulu. (Normal) GEOLOGY/HYDROLOGY: Volcanic mountains. FORESTRY: Dense tropical rainforests in highlands. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Island coastlines and beaches.
1742	51	10/15	Fall	80:59	10:26	50°	23°00'N	157°00'W*		599		122	30	GEOGRAPHY/CARTOGRAPHY: Island of Oahu, Molokai, Lanai, Maui, Kahoolawe. (Normal)

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1742 (cont'd)		1968												GEOLOGY/HYDROLOGY: Volcanic mountains. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Coastlines
1743	51	10/15	Fall	80:59	10:26	50°	$22^\circ 00'$N	$157^\circ 00'$W*		599		122	31	GEOGRAPHY/CARTOGRAPHY: Islands, Oahu, Molokai, Lanai, Maui, Kahoolawe. (Normal) GEOLOGY/HYDROLOGY: Volcanic mountains. METEOROLOGY: Cumulus, thick cirrus. OCEANOGRAPHY: Coastline.
1744	51	10/15	Fall	80:59	10:24	49°	$22^\circ 00'$N	$156^\circ 30'$W*		599 634		122	35	GEOGRAPHY/CARTOGRAPHY: Hawaiian Islands, MoloKai, Lanai, Maui, Kahoolawe, and Hawaii. (Normal) GEOLOGY/HYDROLOGY: Volcanics. METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Island coastlines.
1745	51	10/15	Fall	81:00	10:21	49°	$21^\circ 30'$N	$156^\circ 00'$N*				123	43	GEOGRAPHY/CARTOGRAPHY: Islands, Hawaii and Maui. (Normal) GEOLOGY/HYDROLOGY: Volcanics, dendritic drainage. METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Island coastlines.
1746	51	10/15	Fall	81:00	10:21	50°	$32^\circ 02'$N	$155^\circ 40'$W		634		123	50	GEOLOGY/CARTOGRAPHY: Island of Hawaii. (Normal) GEOLOGY/HYDROLOGY: Volcanics, dendritic drainage. METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Island coastline.
1747	51	10/15	Fall	81:00	10:18	49°	$21^\circ 30'$N	$155^\circ 20'$W*		634		123	70	GEOGRAPHY/CARTOGRAPHY: Island of Hawaii. (Normal) GEOLOGY/HYDROLOGY: Volcanics, dendritic drainage. METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Island coastline.
1748	52	10/15	Fall	82:08	06:57	10°	$32^\circ 02'$N	$85^\circ 00'$E			H-9	132	0	GEOGRAPHY/CARTOGRAPHY: India, Nepal, South China, Himalayas, Mt. Everest, Ganges R., Ghaghra R., Lakes Tangra, Tsho and Terinam Tsho. (Normal) GEOLOGY/HYDROLOGY: Complex mountain system, with perennial and intermittent streams. FORESTRY: Dense evergreen forests on southern slopes.
1749	53	10/15	Fall	83:09	08:06	25°	$27^\circ 00'$N	$81^\circ 00'$E*			H-9	129	18	GEOGRAPHY/CARTOGRAPHY: India, Nepal, Himalayan

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINCIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												Foothills, Ganges Plain, Ghaghara River, Towns of Lucknow and Shanjahanpur. (Light) GEOLOGY/HYDROLOGY: Interior elevated plains with meandering perennial drainage and flood plain. METEOROLOGY: Strato-cumulus, cirrus. FORESTRY: Scattered to semi dense stands of mixed species.
1750	53	10/15	Fall	83:50	11:01	25°	31°00'N	122°00'E*			H-12	123	50	GEOGRAPHY/CARTOGRAPHY: China, Yantze River, Lake Tai Hu, Shanghai, East China Sea. (Light) GEOLOGY/HYDROLOGY: Delta and sedimentation outflow from the meandering Yangtze. METEOROLOGY: Cumulus, thick cirrus.
1751	53	10/15	Fall	83:50	11:06	48°	31°00'N	122°00'E*				123	20	GEOGRAPHY/CARTOGRAPHY: Shanghai, Yangtze River, East China Sea. (Light) METEOROLOGY: Cumulus, thick cirrus. OCEANOGRAPHY: Sediments polluting offshore water showing direction and dispersion of littoral drift. Nearshore current setting southwesterly.
1752	53	10/15	Fall	83:50	11:05	48°	31°00'N	123°00'E*				123	30	GEOGRAPHY/CARTOGRAPHY: China, Shanghai, Minttane, Chung Ming Tao Island, at Yangtze River mouth. (Light) GEOLOGY/HYDROLOGY: Coastal Flood Plain. METEOROLOGY: Cumulus, strato-cumulus, cirrus. OCEANOGRAPHY: Sediments polluting offshore water with nearshore current setting southwesterly.
1753	53	10/15	Fall	83:50	11:01	48°	30°51'N	121°57'E			H-12	123	36	GEOGRAPHY/CARTOGRAPHY: China, mouth of the Yangtze River, East China Sea. (Light) GEOLOGY/HYDROLOGY: Coastal Flood Plain. METEOROLOGY: Cumulus, strato-cumulus, cirrus. OCEANOGRAPHY: Sediments polluting offshore water showing definite direction and dispersion patterns to the southwest by nearshore currents.
1754	53	10/15	Fall	83:50	11:02	48°	30°40'N	122°20'E*			H-12	123	46	GEOGRAPHY/CARTOGRAPHY: China, mouth of Yangtze River, East China Sea. (Light) GEOLOGY/HYDROLOGY: Coastal Flood Plain. METEOROLOGY: Cumulus, thick cirrus. OCEANOGRAPHY: Sediments outflowing from Yangtze River in a southwesterly direction.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1755	53	10/15	Fall	83:50	10:59	48°	30°57'N	121°43E			H-12	123	34	GEOGRAPHY/CARTOGRAPHY: China, mouth of Yangtze River, East China Sea, Shanghai, Hang Chow Bay. (Light) GEOLOGY/HYDROLOGY: Coastal Flood Plain METEOROLOGY: Cumulus, thick cirrus. OCEANOGRAPHY: Definite gradation of sedimentary outflow from the Yangtze River mouth.
1756	53	10/15	Fall	83:50	11:01	48°	31°20'N	122°00'E*			H-12	123	28	GEOGRAPHY/CARTOGRAPHY: China, mouth of Yangtze River, East China Sea. (Light) GEOLOGY/HYDROLOGY: Coastal Flood Plain. METEOROLOGY: Cumulus, thick cirrus. OCEANOGRAPHY: Definite gradation of sedimentary outflow from the Yangtze River mouth, nearshore current setting in a southwesterly direction.
1757	53	10/15	Fall	83:52	11:43	51°	30°00'E	132°00'E*			H-13	121	52	GEOGRAPHY/CARTOGRAPHY: Southern Japan, Kagoshima Bay and Islands of Yakushima and Tanegaishima, Pacific Ocean and East China Sea. (Light) GEOLOGY/HYDROLOGY: Volcanics. METEOROLOGY: Cumulus, thick cirrus.
1758	54	10/15	Fall	85:18	10:16	43°	31°40'N	88°48'E			H-9	123	19	GEOGRAPHY/CARTOGRAPHY: China, Plateau of Tibet, Lake Seling Tsho and Nagtsong Tsho Lake. (Normal) GEOLOGY/HYDROLOGY: Sedimentary plateau with perennial lakes and snow covered hills. METEOROLOGY: Towering cumulus.
1759	54	10/15	Fall										80	GEOGRAPHY/CARTOGRAPHY: Himalayas. (Normal) METEOROLOGY: Towering cumulus, alto-cumulus, cirrus.
1760	54	10/15	Hot-Wet	85:33	14:56	40°	07°30'N	155°00'E*				127	12	GEOGRAPHY/CARTOGRAPHY: Oroluk Lagoon and Caroline Islands in the Pacific Ocean. (Dark) METEOROLOGY: Small cumulus, towering cumulus. OCEANOGRAPHY: Coral atoll with color differentation.
1761		10/15											100	METEOROLOGY: Cumulus, alto-cumulus, cirrus. (Dark)
1762		10/15											100	METEOROLOGY: Towering cumulus, cirrus. (Dark)

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1763		10/15											75	METEOROLOGY: Towering cumulus, cirrus. (Dark)
1764	56	10/15	Fall	88:09	08:00	22°	$31^{\circ}30'$N	$12^{\circ}00'$E*				130	33	GEOGRAPHY/CARTOGRAPHY: Tunisia Gulfo de Gabis. (Dark) GEOLOGY/HYDROLOGY: Erg plains and coastal plain adjacent to the Gulf. METEOROLOGY: Cumulus.
1765	56	10/15	Fall	88:11	08:46	29°	$35^{\circ}00'$N	$23^{\circ}00'$E*				127	20	GEOGRAPHY/CARTOGRAPHY: Cyprus, Turkey, Mediterranean Sea. (Dark) METEOROLOGY: Cumulus, cirrus.
1766	56	10/15	Spring	88:41	16:36	18°	$05^{\circ}30'$S	$133^{\circ}00'$E*				135	63	GEOGRAPHY/CARTOGRAPHY: Kepuluan Kai, Banda Sea, North of Australia. (Dark) METEOROLOGY: Cumulus, cirrus.
1767	56	10/15	Spring	88:41	16:36	18°	$12^{\circ}00'$S	$133^{\circ}00'$E*				136	26	GEOGRAPHY/CARTOGRAPHY: Australia, Northern Territory, Van Diemen Gulf. (Dark) METEOROLOGY: Cumulus, strato-cumulus, cirrus.
1768	56	10/15	Spring	88:42	16:54	16°	$12^{\circ}30'$S	$135^{\circ}15'$E*				136	13	GEOGRAPHY/CARTOGRAPHY: Australia, Northern Territory, Queensland, Gulf of Carpentaria. (Dark) METEOROLOGY: Cumulus, strato-cumulus, cirrus.
1769	56	10/15	Hot-Wet	88:42	16:45	16°	$12^{\circ}35'$S	$135^{\circ}17'$E			N-14	136	23	GEOGRAPHY/CARTOGRAPHY: Australia, Northern Territory, *Wessel Islands*, Howard Island, Buckingham Bay, Arnhem Bay. (Light) METEOROLOGY: Cumulus, cirrus. FORESTRY: Several smoke plumes from fires. OCEANOGRAPHY: Sun-glint area off the coast.
1770	56	10/15	Hot-Wet	88:42	16:49	16°	$14^{\circ}20'$S	$135^{\circ}45'$E			N-14	137	37	GEOGRAPHY/CARTOGRAPHY: Australia, Queensland, Western Gulf of Carpentaria, Limmex Bight. (Light) METEOROLOGY: Cumulus, cirrus. FORESTRY: Smoke plumes.
1771	56	10/15	Spring	88:43	17:10	11°	$16^{\circ}54'$S	$140^{\circ}11'$E			P-14	137	53	GEOGRAPHY/CARTOGRAPHY: Australia, Queensland, Gulf of Carpentaria, Wellesly Islands. (Light) METEOROLOGY: Cumulus, strato-cumulus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1772	58	10/15	Fall	91:19	13:02	56°	19°30'N	40°00'E*			J-6	88	2	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Red Sea, Hamdanah, Abo Latt Coral Reefs. (Normal) GEOLOGY/HYDROLOGY: Coastal plain and coral reef build-up offshore. OCEANOGRAPHY: Coral reefs, atolls, clear water, wave front/current pattern in sun-glint area. METEOROLOGY: Small cumulus.
1773	58	10/15	Fall	91:19	13:03	56°	19°43'N	40°12'E			J-6	88	2	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Red Sea, Hamdanah, Ad Dugah, Abo Latt Coral Reefs. (Normal) AGRICULTURE: Small field patterns. GEOLOGY/HYDROLOGY: Coastal plain and coral reef build-up offshore. OCEANOGRAPHY: Coral reefs and a possible wave front in the sun glint area. METEOROLOGY: Small cumulus.
1774	58	10/15	Fall	91:19	13:06	56°	18°50'N	40°38'E			J-6	88	2	GEOGRAPHY/CARTOGRAPHY: Arabian coast, Red Sea, Al Qunfundah. (Normal) AGRICULTURE: Extensive dry land cultivation in delta area. GEOLOGY/HYDROLOGY: Dome structure, dendritic intermittent streams (braided) on the sedimentary hill region. OCEANOGRAPHY: Coral reefs partly obscured by sun-glint, no breakers over reefs. METEOROLOGY: Small cumulus.
1775	58	10/15	Fall	91:19	13:15	54°	19°20'N	43°20'E*				89	0	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Asia Mts. (Normal) GEOLOGY/HYDROLOGY: Complex, folded mountains with intermittent dendritic streams.
1776	58	10/15	Fall	91:21	13:24	57°	14°00'N	45°00'E*			K-6	89	50	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Yemen, South Arabia, Southwest corner, Red Sea. (Light) GEOLOGY/HYDROLOGY: Coastal plain and intermittent streams. METEOROLOGY: Cumulus, stratus.
1777	58	10/15	Fall	91:22	13:41	52°	14°20'N	49°02'E			K-6	90	37	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Aden, Gulf of Aden, Al Mukalla Sharma Bay. (Normal)

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINCIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												GEOLOGY/HYDROLOGY: Complex and sedimentary hills and mountains, volcanic plain with intermittent drainage. FORESTRY: Low shrub forms. METEOROLOGY: Towering cumulus, part of cumulus-nimbus. OCEANOGRAPHY: Sun glint in the nearshore area.
1778	58	10/15	Fall	91:22	13:43	52°	14°35'N	49°47'E			K-6	90	39	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Gulf of Aden, Aden. (Normal) GEOLOGY/HYDROLOGY: Complex, sedimentary hills and mountains, consequent intermittent wadis throughout the area. FORESTRY: Low shrub form. METEOROLOGY: Towering cumulus, small cumulus. OCEANOGRAPHY: Sun-glint in nearshore area.
1779	58	10/15	Fall	91:23	14:00	50°	12°20'N	53°30'E			K-6	91	36	GEOGRAPHY/CARTOGRAPHY: Island of Socotra, located off coast of Somali, Africa, Gulf of Aden and Indian Ocean. (Normal) GEOLOGY/HYDROLOGY: Complex hills and mountains, coastal plain and alkali deposits. METEOROLOGY: Towering cumulus, cumulus, cirrus. OCEANOGRAPHY: Evident current patterns (possibly a manifestation of the strong Somali Current) and wave fronts with a line of surf offshore probably denoting a reef or bar.
1780	60	10/15	Hot-Wet	94:30	14:09	25°	07°48'S	39°10'E			M-5	108	65	GEOGRAPHY/CARTOGRAPHY: Mafia Island off coast of East Africa, Tanzania, Mafia Channel. (Light) GEOLOGY/HYDROLOGY: Meandering perennial streams on the coastal plain METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Partial sun-glint area.
1781	60	10/15	Hot-Wet	94:30	14:11	25°	08°05'S	39°23'E	1:4,333,330		N-5	108	80	GEOGRAPHY/CARTOGRAPHY: South of Mafia Island, East Coast of Africa, Tanzania. (Light) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Cumulus, alto-cumulus. FORESTRY: Intermittent forest lands. OCEANOGRAPHY: Depth differences outlining the boundary between continental shelf and continental slope.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINCIPAL POINT LATITUDE	PRINCIPAL POINT LONGITUDE	APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS WAC	MAP PLOTS ONC	ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
		1968												
1782		10/15											38	GEOGRAPHY/CARTOGRAPHY: An Island. METEOROLOGY: Cumulus, strato-cumulus.
1783	61	10/15	Hot-Wet	95:52	14:18	43°	05°20'N	03°53'W	1:3,333,330		L-2	95	88	GEOGRAPHY/CARTOGRAPHY: West Africa - Ivory Coast, Ghana,cities of Abidjan and Treichville. (Light) GEOLOGY/HYDROLOGY: Coastal plain, dendritic drainage. METEOROLOGY: Cumulus, alto-cumulus. FORESTRY: Densely forested.
1784	61	10/15	Hot-Wet	95:52	14:11	42°	05°12'N	01°49'W	1:4,000,000		L-2	95	76	GEOGRAPHY/CARTOGRAPHY: Ghana, Africa, city of Sekondi. (Light) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Comulus, thick cirrus. FORESTRY: Densely forested.
1785	61	10/15	Cool-Dry	95:55	15:30	33°	00°00'	08°00'E*				102	64	GEOGRAPHY/CARTOGRAPHY: Galoon, Port Gentii. (Light. GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Cumulus, thick cirrus.
1786	61	10/15		95:56	15:49	30°	04°30'S	12°30'E*				103		Overexposed
1787	61	10/15	Fall	97:04	09:46		29°51'N	95°12'W	1:3,860,000		H-24	95	53	GEOGRAPHY/CARTOGRAPHY: Texas, Houston area. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Cumulus.
1788	61	10/15	Fall	97:04	09:46	40°	29°52'N	95°03W	1:3,650,000		H-24	95	43	GEOGRAPHY/CARTOGRAPHY: Houston area, Texas. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Cumulus.
1789	61	10/15	Fall	97:05	10:07	43°	29°57'N	90°14W	1:3,410,000		H-24	94	22	GEOGRAPHY/CARTOGRAPHY: Louisiana, New Orleans area, Lake Pontchartrain, regional transportation network. (Dark) GEOLOGY/HYDROLOGY: Low alluvial plain FORESTRY: Marsh vegetation - intermittent.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1790	61	10/15	Fall	97:05	10:08	43°	$29^\circ58'$N	$90^\circ22'$W	1:2,410,000		H-24	94	20	GEOGRAPHY/CARTOGRAPHY: Louisiana, New Orleans, Lake Pontchartrain area. (Dark) GEOLOGY/HYDROLOGY: Low alluvial plain. METEOROLOGY: Cumulus.
1791	61	10/15	Fall	97:05	10:13	43°	$30^\circ45'$N	$88^\circ20'$W*			H-24	94		GEOGRAPHY/CARTOGRAPHY: Alabama, Mobile area. (Dark) Too dark to extract any other information.
1792	61	10/15	Fall	97:05	10:10	45°	$29^\circ00'$N	$89^\circ40'$W*			H-24	93	22	GEOGRAPHY/CARTOGRAPHY: Louisiana, mouth of Mississippi River Delta. (Dark) METEOROLOGY: Cumulus. Too dark to extract any other information.
1793	61	10/15	Fall	97:06	10:19	45°	$30^\circ10'$N	$87^\circ30'$W*			H-24	93	04	GEOGRAPHY/CARTOGRAPHY: Florida, Pensacola area. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Cumulus.
1794	61	10/15	Fall	97:06	10:26	46°	$30^\circ00'$N	$86^\circ01'$W	1:2,812,500		H-24	97	08	GEOGRAPHY/CARTOGRAPHY: Florida, Apalachicola area. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Strato-cumulus.
1795	62	10/15	Fall	98:32	09:51	41°	$31^\circ00'$N	$116^\circ00'$W	1:5,750,000		H-22	97	04	GEOGRAPHY/CARTOGRAPHY: Mexico; Baja California; Punta Colmett, Sierra San Pedro, Matir Mts. (Normal) GEOLOGY/HYDROLOGY: Narrow coastal plain, plateau and complex fold - mountain range - trellis drainage. METEOROLOGY: Cumulus.
1796	62	10/15	Fall	98:33	10:08	43°	$30^\circ42'$N	$111^\circ58'$W	1:3,000,000		H-22	96	03	GEOGRAPHY/CARTOGRAPHY: Mexico: Sorora, Caborca, Rio Magdolena. (Normal) GEOLOGY/HYDROLOGY: Complex hills, plateau and alluvial plains, dendritic drainage. METEOROLOGY: Cumulus. AGRICULTURE: Field patterns, grazing land.
1797	62	10/15	Fall	98:35	10:27	46°	$30^\circ24'$N	$107^\circ42'$W			H-23	94	07	GEOGRAPHY/CARTOGRAPHY: Mexico: Nuevo Casas Granele, Rio de Santa Maria, Rio de Casas Grandes. (Normal) GEOLOGY/HYDROLOGY: Complex plateau and folded mountains, trellis drainage. METEOROLOGY: Towering cumulus. FORESTRY: Forest along major streams.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1798	62	10/15	Fall	98:35	10:32	46°	30°08'N	106°37'W			H-23	94	1	GEOGRAPHY/CARTOGRAPHY: Mexico: Villa Alumeda, Luguna de Patos. (Normal) GEOLOGY/HYDROLOGY: Complex range, alluvial plain, and dendritic drainage. METEOROLOGY: Cumulus. AGRICULTURE: Field patterns in the valley.
1799	62	10/15	Fall	98:36	10:52	49°	29°15'N	101°56'W			H-23	92	21	GEOGRAPHY/CARTOGRAPHY: Mexico - U.S., Texas Border Comstock, Rio Grande, Serrias Del Burros. (Normal) GEOLOGY/HYDROLOGY: Complete and volcanic range and alluvial regions with trellis drainage. METEOROLOGY: Towering cumulus. FORESTRY: Intermittent forest lands on hills.
1800	62	10/15	Fall	98:38	11:14	52°	28°19'N	96°14'W	1:6,540,000		H-24	91	16	GEOGRAPHY/CARTOGRAPHY: Matagorda Bay, Port Lavaca, Texas--urban development--regional transportation network. (Normal) GEOLOGY/HYDROLOGY: Coastal plain with a shoreline of emergence. METEOROLOGY: Cumulus. OCEANOGRAPHY: Temperature and depth differences along coastal waters with distinct currents noted.
1801	62	10/15											98	METEOROLOGY: Hurricane Gladys, Gulf of Mexico. (Dark)
1802	63	10/15	Fall	100:12	12:59	60°	14°00'N	94°00'W*				88	80	GEOGRAPHY/CARTOGRAPHY: Mexico: Tehuantepec Area. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region. METEOROLOGY: Cumulus, thick cirrus.
1803	64	10/15	Hot-Wet	100:24	15:31	29°	04°00'S	59°00'W*				102	52	GEOGRAPHY/CARTOGRAPHY: Brazil, Amazon Basin. (Dark) METEOROLOGY: Cumulus-nimbus, strato-cumulus, thick cirrus. Too dark to extract any other information.
1804	64	10/15	Hot-Wet	100:26									53	GEOGRAPHY/CARTOGRAPHY: Northwestern Brazil. (Dark) GEOLOGY/HYDROLOGY: Low dissected plateau, trellis drainage. METEOROLOGY: Cumulus-nimbus, strato-cumulus, cirrus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1805	64	10/15	Spring	100:27	16:37	19°	11°35'5	43°20'W*				108	23	GEOGRAPHY/CARTOGRAPHY: South Africa. (Dark) METEOROLOGY: Towering cumulus, cirrus.
1806	64	10/15	Spring	100:29	16:56	15°	14°10'S	39°10'W*				110	15	GEOGRAPHY/CARTOGRAPHY: South Africa, near Durban. (Dark) METEOROLOGY: Small cumulus, towering cumulus.
1807	64	10/15	Spring	101:51	15:40	32°	03°00'S	78°30'W*				100	64	GEOGRAPHY/CARTOGRAPHY: Equader, Peru, Gulf of Guayaquil. (Dark) GEOLOGY/HYDROLOGY: Complex coastal mountain range and a shoreline of submergence. METEOROLOGY: Strato-cumulus, cirrus.
1808	66	10/15	Spring	103:30	18:01	02°	23°00'S	68°00'W*				122	8	GEOGRAPHY/CARTOGRAPHY: Chile, coast north of Antofagadsta. (Light) GEOLOGY/HYDROLOGY: Complex mountains of the Andes, parallel to the coast.
1809	68	10/16	Fall	107:19	7:54	25°	26°20'N	83°00'E*				110	14	GEOGRAPHY/CARTOGRAPHY: Nepal, India, Tibet, Himalayas, Ganges Plains, Annapurna, Dhaulegin. (Light) GEOLOGY/HYDROLOGY: Complex mountains and alluvial plains. FORESTRY: Mountains forested.
1810	72	10/16	Cool-Dry	113:35	13:58	54°	09°45'N	76°20'E	1:4,000,000		K-8	90	46	GEOGRAPHY/CARTOGRAPHY: India: coast at Alleppey, Laccadiva Sea, Chochin. (Dark) GEOLOGY/HYDROLOGY: Coastal plain and shoreline of emergence. METEOROLOGY: Cumulus, alto-cumulus, cirrus.
1811	72	10/16	Cool-Dry	113:36	13:51	54°	08°47'N	77°58'E	1:4,306,000		K-8	91	48	GEOGRAPHY/CARTOGRAPHY: India: southwest coast. (Normal) GEOLOGY/HYDROLOGY: Coastal lowland and deltaic plain. METEOROLOGY: Cumulus, thick cirrus, alto-cumulus. FORESTRY: Intermittent forest and short shrubs along rivers. OCEANOGRAPHY: Ocean depth differences indicating the extent of the continental shelf.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1812	72	10/16	Cool-Dry	113:37	13:51	51°	09°27'N	80°15E	1:2,2000,000		K-8	91	37	GEOGRAPHY/CARTOGRAPHY: Ceylon: Palk Bay, Palk Strait, Jaffua, Delft Island, Point Pedro. (Normal) GEOLOGY/HYDROLOGY: Coastal lowland. METEOROLOGY: Cumulus, alto-cumulus, cirrus. FORESTRY: Intermittent forest land.
1813	72	10/16	Cool-Dry	113:37	14:00	51°	09°00'N	80°00'E*	1:6,250,000		K-8	91	55	GEOGRAPHY/CARTOGRAPHY: Ceylon, Adair's Bon'dge. (Normal) GEOLOGY/HYDROLOGY: Coastal lowland. METEOROLOGY: Cumulus, alto-cumulus, cirrus.
1814	72	10/16	Spring	113:50	17:01	13°						113	03	GEOGRAPHY/CARTOGRAPHY: Western Australia, Roebuck Bay. (Dark) METEOROLOGY: Cumulus.
1815	72	10/16	Spring	113:50	16:59	13°	18°20'S	121°30'E*				113	05	GEOGRAPHY/CARTOGRAPHY: Western Australia, Roebuck Bay, 80 mile beach. (Dark) METEOROLOGY: Cumulus.
1816	72	10/16	Spring	113:51	17:20	11°	21°00'S	124°00'E*				115	04	GEOGRAPHY/CARTOGRAPHY: Western Australia: Percival Lakes, Lake Disappointment. (Dark) METEOROLOGY: Cumulus.
1817	72	10/16	Spring	113:51	17:41	06°	22°13'S	129°05'E	1:4,000,000		P-13	118	00	GEOGRAPHY/CARTOGRAPHY: Western Australia, Lake Mae Kay. (Dark) GEOLOGY/HYDROLOGY: Dry lake basin.
1818	75	10/16	Fall	117:57	12:26	58°	21°11'N	11°15'W			J-2	89		GEOGRAPHY/CARTOGRAPHY: Mauritania. (Light) GEOLOGY/HYDROLOGY: Low plateau and dome structure.
1819	78	10/16	Fall	122:18	11:00	51°	29°30'N	95°30'W*				92	50	GEOGRAPHY/CARTOGRAPHY: Gulf coast, Corpus Christi. (Light) GEOLOGY/HYDROLOGY: Coastal plain region. METEOROLOGY: Cumulus, alto-cumulus.
1820	78	10/16	Fall	122:18	10:53	51°	28°30'N	97°00'N				92	20	GEOGRAPHY/CARTOGRAPHY: Texas: Gulf coast, Corpus Christi. (Light) METEOROLOGY: Cumulus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1821	78	10/16	Fall										50	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Light) METEOROLOGY: Towering cumulus.
1822	78	10/16	Fall										94	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Dark) METEOROLOGY: Hurricane Gladys.
1823	78	10/16	Fall										100	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Light) METEOROLOGY: Hurricane Gladys.
1824	78	10/16	Hot-Wet	122:35	15:16	38°	05°00'S	35°30'W*				98	30	GEOGRAPHY/CARTOGRAPHY: Brazil, Cago de Sao Roque. (Normal) GEOLOGY/HYDROLOGY: Coastal plain region. METEOROLOGY: Cumulus, cirrus.
1825		10/16											50	METEOROLOGY: Cumulus, alto-cumulus, cirrus. (Normal)
1826	81	10/16	Spring	127:11	17:36	05°	23°18'S	69°35'W	1:4,884,400		P-26 Q-26	117	4	GEOGRAPHY/CARTOGRAPHY: Chile: coast at Antofaqusta, Pacific Baluia Moreno, Baluia de Mejilones Del Sur, Sulos de Atucame Labe. (Normal) GEOLOGY/HYDROLOGY: Complex and sedimentary hills and mountains, with salt flats in the lower regions. METEOROLOGY: Cumulus, stratus.
1827	81	10/16	Spring	127:11	17:42	06°	24°09'S	70°29'W	1:4,411,800		P-26 Q-26	117	4	GEOGRAPHY/CARTOGRAPHY: Chile: coast of Antofaqasta, Pacific Ocean, Baluia Moreno, Atacama Desert. (Dark) GEOLOGY/HYDROLOGY: Complex mountains adjacent to the coast, with alluvial deposits on the lower areas. METEOROLOGY: Small cumulus, strato-cumulus.
1828	81	10/16	Spring	127:11	17:44	06°	25°00'S	71°00'W*				117	31	GEOGRAPHY/CARTOGRAPHY: Chile, South of Antofaqusta. (Dark) GEOLOGY/HYDROLOGY: Complex mountain region with a shoreline of submergence. METEOROLOGY: Cumulus, strato-cumulus.
1829	81	10/16	Spring	127:12	17:47	03°	25°00'S	67°00'W*				118		GEOGRAPHY/CARTOGRAPHY: Argentina: Andes Mountains, Sular Del Hombre Muerto. (Dark) GEOLOGY/HYDROLOGY: Folded sedimentary and complex mountains.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT LATITUDE	PRINICIPAL POINT LONGITUDE	APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS WAC	MAP PLOTS ONC	ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
		1968												
1830	81	10/16	Spring	127:12	17:51	03°	25°00'S	66°00'W*				118	16	GEOGRAPHY/CARTOGRAPHY: Argentina: Andes Mountains, Sular Del Hombre Muerto. (Dark) GEOLOGY/HYDROLOGY: Complex mountain region. METEOROLOGY: Strato-cumulus. FORESTRY: Intermittent forest lands.
1831	83	10/17	Fall	131:11	17:41	52°	26°58'N	128°24'E	1:3,400,000		H-13	93	31	GEOGRAPHY/CARTOGRAPHY: Okinawa, Island of Arueri Gunto. (Light) GEOLOGY/HYDROLOGY: Volcanic islands. METEOROLOGY: Cumulus, cirrus. FORESTRY: Intermittent forest lands. AGRICULTURE: Field patterns along the coast. OCEANOGRAPHY: Ocean depth variations.
1832	84	10/17	Cool-dry	132:21	08:02	23°	29°50'N	69°10'E			H-8	118	00	GEOGRAPHY/CARTOGRAPHY: Pakistan: Toba, Kakar and Sulaiuan ranges near Fret Sandeuen. (Dark) GEOLOGY/HYDROLOGY: Highly folded sedimentary mountains.
1833		10/17											4	METEOROLOGY: Cumulus. (Dark)
1834	86	10/17											90	METEOROLOGY: Cumulus, alto-cumulus, cirrus. (Light)
1835			Cool-Dry	135:48	13:29	58°	09°30'N	99°30'E*				89	90	GEOGRAPHY/CARTOGRAPHY: Thailand, Gulf of Siau, Surat Theui, Samui Island. (Normal) GEOLOGY/HYDROLOGY: Coastal plain region. METEOROLOGY: Cumulus, alto-cumulus, cirrus. AGRICULTURE: Field patterns. FORESTRY: Intermittent forest lands.
1836	80	10/17	Cool-Dry	135:48	13:31	58°	09°30'N	99°55'E			K-9	89	58	GEOGRAPHY/CARTOGRAPHY: Thailand, Gulf of Siau, Coast east of Surat Thaui, Sauri Island. (Light) METEOROLOGY: Cumulus, alto-cumulus, cirrus. FORESTRY: Densely forested.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1837	86	10/17	Cool-Dry	135:49	13:35	58°	07°00'N	101°00'E*				89	67	GEOGRAPHY/CARTOGRAPHY: Thailand: Gulf of Siam, Pattuni. (Light) GEOLOGY/HYDROLOGY: Coastal plain region. METEOROLOGY: Cumulus-nimbus, cirrus. AGRICULTURE: Field patterns. FORESTRY: Densely forested.
1838	86	10/17	Hot-Wet	135:49	13:43	58°	05°26'N	102°55'E	1:5,312,500		L-10	89	65	GEOGRAPHY/CARTOGRAPHY: Maleysia, Melaya, west coast of Kota Bheni. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region. METEOROLOGY: Cumulus, strato-cumulus, cirrus. AGRICULTURE: Field patters, subsistence farming along coastal areas. FORESTRY: Densely forested.
1839	86	10/17	Hot-Wet	135:49	13:43	58°	03°14'N	102°57'E	1:5,300,000		L-10	89	74	GEOGRAPHY/CARTOGRAPHY: Maleysia, Melaya, east coast from Chukai to Paleng River. (Dark) GEOLOGY/HYDROLOGY: Coastal plain and perennial drainage. METEOROLOGY: Cumulus, thick cirrus. AGRICULTURE: Scattered fields. FORESTRY: Densely forested.
1840	86	10/17	Spring	135:58	15:42	32°	12°30'S	130°20'E*			N-13	101	50	GEOGRAPHY/CARTOGRAPHY: Australia: Northern Territory, Durion. (Dark) METEOROLOGY: Cumulus, cirrus.
1841	86	10/17	Hot-Wet	135:58	15:42	32°	12°47'S	130°09'E	1:5,500,000		N-13	101	30	GEOGRAPHY/CARTOGRAPHY: Australia: Northern Territory, Darwin, small section of Bathurst Island. (Dark) GEOLOGY/HYDROLOGY: Coastal lowland and shoreline of submergence. METEOROLOGY: Cumulus, cirrus.
1842	86	10/17	Hot-Wet	135:59	16:04	26°	14°16'S	135°38'E	1:8,333,300		N-14	103	15	GEOGRAPHY/CARTOGRAPHY: Australia: Gulf of Carpentaria Grote Eylandt, Roper River. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region with intermittent drainage. METEOROLOGY: Cumulus. FORESTRY: Intermittent forest lands.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1843	86	10/17	Fall	135:59	16:04	26°	15°16'S	135°38'E	1:4,777,800		N-14	103	3	GEOGRAPHY/CARTOGRAPHY: Australia, Gulf of Carpentaria, Mana Island, Lemmis Bight River. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Cumulus. FORESTRY: Forest along coastline and streams. OCEANOGRAPHY: Ocean depths variations.
1844	86	10/17	Spring	136:00	16:21	23°	16°58'S	139°30'E	1:3,000,000		P-14	104	5	GEOGRAPHY/CARTOGRAPHY: Australia, Gulf of Carpentaria, Wellesley and South Wellesley Islands. (Dark) GEOLOGY/HYDROLOGY: Coastal lowland. METEOROLOGY: Cumulus. AGRICULTURE: Scattered field patterns along the coastline. FORESTRY: Intermittent forest lands. OCEANOGRAPHY: Ocean depth variations.
1845	86	10/17	Spring	136:00	16:33	20°	17°50'S	142°55'E			P-14	106	9	GEOGRAPHY/CARTOGRAPHY: Australia, Queensland, Great Diriding Range, Einasleigh River. (Dark) GEOLOGY/HYDROLOGY: Coastal lowland. METEOROLOGY: Cumulus. FORESTRY: Forested along river.
1846	86	10/17	Spring	136:01	16:52	18°						108	12	GEOGRAPHY/CARTOGRAPHY: Australia. (Dark) METEOROLOGY: Cumulus.
1847	86	10/17	Spring	136:01	16:52	18°						108	10	GEOGRAPHY/CARTOGRAPHY: Australia. (Dark) METEOROLOGY: Cumulus.
1848	86	10/17	Cool-Dry	136:02	16:48	18°						109	8	GEOGRAPHY/CARTOGRAPHY: Australia. (Dark) METEOROLOGY: Cumulus.
1849	87	10/17	Cool-Dry	137:17	13:34	58°	08°30'N	78°25'E	1:3,000,000		K-8	88	59	GEOGRAPHY/CARTOGRAPHY: India, southern tip, east coast of Tuhcoria. (Normal) GEOLOGY/HYDROLOGY: Coastal lowland. METEOROLOGY: Cumulus, thick cirrus. AGRICULTURE: Small fields.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT LATITUDE	PRINICIPAL POINT LONGITUDE	APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS WAC	MAP PLOTS ONC	ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
		1968												
1850	87	10/17	Cool-Dry	137:17	13:42	56°	08°00'N	80°30'E*				89	54	GEOGRAPHY/CARTOGRAPHY: Northern Ceylon. (Normal) GEOLOGY/HYDROLOGY: Coastal plain region. METEOROLOGY: Cumulus, thick cirrus, alto-cumulus. FORESTRY: Intermittent forest lands.
1851	87	10/17	Cool-Dry	137:18	13:44	57°	06°05'N	80°36'E			L-8	89	50	GEOGRAPHY/CARTOGRAPHY: Ceylon, southern coast, Gable. (Light) GEOLOGY/HYDROLOGY: Coastal plain and complex plateau. METEOROLOGY: Cumulus, alto-cumulus. FORESTRY: Intermittent forest lands.
1852	87	10/17	Spring	137:34	16:45	16°	17°00'S	122°00'E*				108	16	GEOGRAPHY/CARTOGRAPHY: Western Australia, King Sound. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Strato-Cumulus.
1853	87	10/17	Spring	137:34	16:45	16°	19°00'S	122°00'E*				109	6	GEOGRAPHY/CARTOGRAPHY: Western Australia, La Grange Bay. (Dark) GEOLOGY/HYDROLOGY: Coastal Plain. METEOROLOGY: Strato-cumulus.
1854	87	10/17	Spring	137:34	16:52	15°						110	4	GEOGRAPHY/CARTOGRAPHY: Western Australia, Great Sandy Desert. (Dark) METEOROLOGY: Strato-cumulus.
1855	87	10/17	Spring	137:34	17:01	14°	18°30'S	126°00'E*				111	00	GEOGRAPHY/CARTOGRAPHY: Western Australia, Fitgrog and Margaret rivers. (Dark) FORESTRY: Forested along streams.
1856	87	10/17	Spring	137:35	17:09	10°	28°58'S	138°58'E			Q-14	112	00	GEOGRAPHY/CARTOGRAPHY: Western Australia, Gregory Lake. (Dark) GEOLOGY/HYDROLOGY: Lowland basin. FORESTRY: Bushes along streams.
1857	87	10/17	Spring	137:35	18:14	10°	22°38'S	128°44'E	1:2,900,000		P-13	113	00	GEOGRAPHY/CARTOGRAPHY: Western Australia, Northern Territory, Lake Mackay, Great Sandy Desert. (Dark) GEOLOGY/HYDROLOGY: Partially dry lake basin in the lowland plains.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT LATITUDE	PRINICIPAL POINT LONGITUDE	APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS WAC	MAP PLOTS ONC	ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
1858	87	1968 10/17	Spring	137:36		09°						114	00	GEOGRAPHY/CARTOGRAPHY: Australia: Northern Territory, near Alice Springs.
1859	87	10/17	Spring	137:36	17:28	08°						115	00	GEOGRAPHY/CARTOGRAPHY: Australia: Northern Territory MacConnall Ranges, Alice Springs. (Dark) GEOLOGY/HYDROLOGY: Folded sedimentary mountain region.
1860	87	10/17	Spring	137:37		07°						116	00	GEOGRAPHY/CARTOGRAPHY: Australia: Northern Territory, near Alice Springs. (Dark) GEOLOGY/HYDROLOGY: Folded mountain region.
1861	90	10/17	Hot-Wet	141:50	14:51	43°	03°30'S	29°30'E*					48	GEOGRAPHY/CARTOGRAPHY: Tanzania, Burundi Republic of Congo, Lake Tanganyika. (Light) GEOLOGY/HYDROLOGY: Coastal lowland and complex plateau bounded by rift valley. METEOROLOGY: Cumulus. FORESTRY: Savanna grassland.
1862	90	10/17	Hot-Wet	141:50	14:21	43°	04°45'S	29°32'E	1:2,222,200		M-4	98	26	GEOGRAPHY/CARTOGRAPHY: Tanzania, Burundi Republic of Congo, Lake Tanganyika, Kigoma, Ujiji. (Light) GEOLOGY/HYDROLOGY: Complex plateau and coastal plain. METEOROLOGY: Cumulus, cirrus. AGRICULTURE: Field patterns along the lake.
1863	90	10/17	Fall	142:51	07:32	17°	31°30'N	95°30'W*				112	31	GEOGRAPHY/CARTOGRAPHY: Texas: Waco, Forth Worth, Dallas. (Normal) GEOLOGY/HYDROLOGY: Central plains. METEOROLOGY: Cumulus, alto-cumulus. FORESTRY: Intermittent forest lands.
1864	90	10/17	Fall	142:51	07:38	19°	29°00'N	94°00'W*				112	50	GEOGRAPHY/CARTOGRAPHY: Texas: Houston area. (Light) GEOLOGY/HYDROLOGY: Coastal plains. METEOROLOGY: Cumulus, alto-cumulus.
1865	90	10/17	Fall	142:52								111	5	GEOGRAPHY/CARTOGRAPHY: Texas. (Normal) METEOROLOGY: Cumulus, cirrus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1866	90	10/17	Fall	142:52	07:37	17°	33°30'N	94°30'W*				111	10	GEOGRAPHY/CARTOGRAPHY: Texas, Louisiana, Red River north to Shreveport. (Normal) METEOROLOGY: Strato-cumulus.
1867	91	10/17	Fall	143:09	12:56	64°	15°00'N	19°00'W*				86	25	GEOGRAPHY/CARTOGRAPHY: Cape Verde Islands in East Pacific off Mauritania. (Normal) GEOLOGY/HYDROLOGY: Volcanic islands. METEOROLOGY: Clouds in the horizon. OCEANOGRAPHY: Ocean depth variations.
1868	91	10/17	Cool-Dry	143:12	13:29	60°	06°40'N	11°40'W*				87	80	GEOGRAPHY/CARTOGRAPHY: Siarre Leon: Coast East of Shebur Strait. (Normal) GEOLOGY/HYDROLOGY: Coastal lowland. METEOROLOGY: Cumulus, alto-cumulus. AGRICULTURE: Field patterns along coastal areas. FORESTRY: Savanna grassland.
1869	91	10/17	Hot-Wet	143:20	15:19	38°	09°37'S	13°22'E	1:4,000,000		N-3	98	27	GEOGRAPHY/CARTOGRAPHY: Angola: Coast at Luanda, Rio Cuanza, Gulf of Guinea. (Light) GEOLOGY/HYDROLOGY: Narrow coastal plain and complex plateau. METEOROLOGY: Cumulus, alto-cumulus, cirrus. AGRICULTURE: Field patterns along the coastal areas. FORESTRY: Savanna grassland.
1870	91	10/17	Fall	144:26	09:13	36°	79°00'N	94°00'W*				101	28	GEOGRAPHY/CARTOGRAPHY: Texas: Houston area, Galveston Bay, Lake Houston, Brazos River, Colorado River, regional and local Houston highway network. (Dark) GEOLOGY/HYDROLOGY: Flat lowland and coastal plain. METEOROLOGY: Cumulus, alto-cumulus. FORESTRY: Scattered forest lands in predominantly prairie grassland.
1871	91	10/17	Fall	144:26	09:15	36°	29°00'N	94°30'W*				101	40	GEOGRAPHY/CARTOGRAPHY: Texas: Houston area, Galveston Bay, Lake Houston, Brazos River, highway network. (Dark) GEOLOGY/HYDROLOGY: Flat lowland and coastal plain. METEOROLOGY: Towering cumulus, alto-cumulus. FORESTRY: Scattered forest lands in predominantly prairie grassland.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1872	91	10/17	Fall	144:26	09:16	36°	29°31'N	94°53'W	1:5,000,000		H-24	101	35	GEOGRAPHY/CARTOGRAPHY: Texas: Houston area, Galveston, Lake Houston, Brazos River, local and regional highway network. (Dark) GEOLOGY/HYDROLOGY: Flat lowland and coastal plain. METEOROLOGY: Towering cumulus, alto-cumulus. FORESTRY: Scattered forest lands in predominantly prairie grassland.
1873	91	10/17	Fall	144:26	09:18	36°	29°12'N	95°17'W	1:5,000,000		H-24	101	25	GEOGRAPHY/CARTOGRAPHY: Texas: Houston area, Galveston Bay, Lake Houston, Brazos River, local and regional transportation network. (Dark) GEOLOGY/HYDROLOGY: Flat lowland and coastal plain. METEOROLOGY: Towering cumulus, alto-cumulus. FORESTRY: Scattered forest lands in predominantly prairie area.
1874	91	10/17	Fall	144:27		45°						99	4	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Light) METEOROLOGY: Hurricane Gladys.
1875	91	10/17	Fall	144:27		45°						99	64	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Dark) METEOROLOGY: Hurricane Gladys.
1876	91	10/17	Fall	144:28		45°						99	99	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Dark) METEOROLOGY: Hurricane Gladys.
1877	91	10/17	Fall	144:28		45°						99	99	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Dark) METEOROLOGY: Hurricane Gladys.
1878	91	10/17	Fall	144:28		45°						99	90	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Dark) METEOROLOGY: Hurricane Gladys.
1879	91	10/17	Fall	144:28		45°						99	90	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. (Dark) METEOROLOGY: Hurricane Gladys.
1880	103	10/18	Spring	162:44	17:23	09°	26°50'S	114°00'E	1:6,250,00		Q-12	112	11	GEOGRAPHY/CARTOGRAPHY: Shark Bay, Western Australia. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region. METEOROLOGY: Strato-cumulus.

TABLE A-II.- SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
1880 (cont'd)		1968												FORESTRY: Dense shrubform changing to scattered shrubform and grassland. OCEANOGRAPHY: Some wave action along coastline.
1881	103	10/18	Spring	162:44	17:27	09°	$26^{\circ}13'S$	$114^{\circ}45'E$	1:3,000,000		Q-12	112	02	GEOGRAPHY/CARTOGRAPHY: Shark Bay, Western Australia. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region. FORESTRY: Intermittent shrubform and coastal savanna grass. OCEANOGRAPHY: Coastal shallows, sand bars.
1882	103	10/18	Spring	162:45	17:40	05°	$24^{\circ}40'S$	$113^{\circ}57'E$			Q-12	113	00	GEOGRAPHY/CARTOGRAPHY: Lakes Austin, Barlee, Ballard, Salt Lakes, Western Australia. (Dark)
1883	104	10/18	Hot-Wet	164:02	13:48	59°	$02^{\circ}22'S$	$40^{\circ}32'E$	1:4,740,000		M-5	88	75	GEOGRAPHY/CARTOGRAPHY: Kenya Coastline, Formosa Bay, Tana River, Siyu Channel. (Dark) METEOROLOGY: Towering cumulus.
1884	104	10/18	Hot-Wet	164:02	13:53	58°	$01^{\circ}07'S$	$41^{\circ}47'E$	1:3,333,330		M-5	88	38	GEOGRAPHY/CARTOGRAPHY: Somali, Kenya Coastline, South of Chismaio. (Dark) METEOROLOGY: Small cumulus, towering cumulus. OCEANOGRAPHY: Coastline and beaches.
1885	10/18												55	METEOROLOGY: Cirrus.
1886	10/18												50	GEOGRAPHY/CARTOGRAPHY: Coast of N.W. Africa. METEOROLOGY: Small cumulus, cirrus.
1887	105	10/18	Hot-Wet	165:33	14:53	44°	$12^{\circ}06'S$	$34^{\circ}46'E$	1:8,333,330		N-5		68	GEOGRAPHY/CARTOGRAPHY: Lake Nyasa, Malawi, Mozambique. (Dark) GEOLOGY/HYDROLOGY: Rift zone lake with boundary fractures and lying within the complex Vypiya mountains. METEOROLOGY: Cumulus. FORESTRY: Intermittent shrubform and savanna grassland, smoke apparent.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINCIPAL POINT LATITUDE	PRINCIPAL POINT LONGITUDE	APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS WAC	MAP PLOTS ONC	ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
		1968												
1888	105	10/18	Spring	165:36	15:45	32°	20°08'S	45°50'E	1:6,111,110		P-6		50	GEOGRAPHY/CARTOGRAPHY: Madagascar, central part of island, Morondana, Tannana River. (Dark) GEOLOGY/HYDROLOGY: Coastal plain and plateau region with perennial drainage. METEOROLOGY: Cumulus FORESTRY: Intermittent shrubform and savanna grasslands. OCEANOGRAPHY: Coastline visible.
1889		10/18												Terminator. (Dark)
1890														Blank.
1891	105	10/18	Fall										98	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. METEOROLOGY: Hurricane Gladys.
1892	105	10/18	Fall										100	GEOGRAPHY/CARTOGRAPHY: Gulf of Mexico. METEOROLOGY: Hurricane Gladys.
1893	106	10/18	Fall	166:38	08:20	32°	28°13'N	80°13'W	1:2,750,000		H-25		47	GEOGRAPHY/CARTOGRAPHY: KSC Florida, regional transportation network. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Towering cumulus.
1894	106	10/18	Fall	168:13	08:27	48°	21°43'N	81°57'W	1:5,000,000		J-26		56	GEOGRAPHY/CARTOGRAPHY: Cuba, Bay of Pigs, Ensenada de Broa. (Dark) AGRICULTURE: Scattered cultivation. GEOLOGY/HYDROLOGY: Coastal plain region with sedimentation buildup and distinct shelf variation off shore. METEOROLOGY: Cumulus, alto-cumulus, cirrus. FORESTRY: Intermittent dense tropical hardwood forests. OCEANOGRAPHY: Depth changes.
1895	107	10/18	Fall	168:13	10:04	49°	23°00'N	78°00'W*					59	METEOROLOGY: Alto-cumulus, strato-cumulus. (Normal) OCEANOGRAPHY: Shelf variation.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT LATITUDE	PRINICIPAL POINT LONGITUDE	APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS WAC	MAP PLOTS ONC	ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
		1968												
1896	107	10/18	Fall	168:15	10:29	54°	21°33'N	72°14'W	1:1,750,000		J-27		42	GEOGRAPHY/CARTOGRAPHY: Caico Islands, Great Abaco Islands, transportation network. (Normal) GEOLOGY/HYDROLOGY: Quaternary marine and coastal deposits. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Depth differences.
1897	107	10/18	Fall	168:15	10:32	54°	21°53'N	71°40'W	1:1,750,000		J-27		70	GEOGRAPHY/CARTOGRAPHY: Caico Islands, Great Abaco Islands, transportation network. (Normal) GEOLOGY/HYDROLOGY: Quaternary marine and coastal deposits. FORESTRY: Dense tropical hardwood. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Depth differences.
1898	107	10/18	Fall	168:16	10:45	59°	18°08'N	68°26'W	1:2,439,00		J-27		38	GEOGRAPHY/CARTOGRAPHY: Dominican Republic, Southwestern end of island. (Dark) GEOLOGY/HYDROLOGY: Quaternary marine and coastal deposits. METEOROLOGY: Cumulus, thick cirrus. FORESTRY: Dense tropical hardwood in southeastern corner of island. OCEANOGRAPHY: Shallow waters along the coast.
1899	115	10/19	Hot-Wet	182:07	14:12	54°	13°13'S	135°39'E	1:4,444,440		N-14		34	GEOGRAPHY/CARTOGRAPHY: Australia, Northern Range, Bickerton Island, Blue Mud Bay. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region with a shoreline of submergence. METEOROLOGY: Cumulus, cirrus. FORESTRY: Dense forest stands along coast becoming intermittent inland. OCEANOGRAPHY: Coastline and shallows.
1900	115	10/19	Hot-Wet	182:08	14:37	48°	13°02'S	141°26'E	1:4,230,800		N-14		8	GEOGRAPHY/CARTOGRAPHY: Australia, West Coast of Cape York, Coral Sea. (Dark) AGRICULTURE: Possible cultivation pattern. GEOLOGY/HYDROLOGY: Coastal plain region bordered by swamp areas. FORESTRY: Intermittent stands ranging from semidense to dense, smoke plumes.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1901	115	10/19	Hot-Wet	182:09	14:43	47°	13°09'S	143°26'E	1:4,500,000		N-14		30	GEOGRAPHY/CARTOGRAPHY: Australia, west coast of Cape York, Coral Sea, Campbell Point, Great Barnieo Reef. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region with bordering swamps and off shore coral reefs. FORESTRY: Intermittent dense forest and scattered shrubform, open grasslands along major drain. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Ocean depth differences.
1902	115	10/19	Hot-Wet	182:09	14:43	45°	14°34'S	144°45'E	1:5,000,000		N-14		24	GEOGRAPHY/CARTOGRAPHY: Australia, Cape Melville Princess Charlotte Bay. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region with coastal swamp, shoreline of submergence, and off shore coral reefs. FORESTRY: Intermittent forests with scattered shrubform and grass, several fires. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Reefs
1903	116	10/19	Spring	183:45	15:56	29°	26°30'S	137°00'E*			Q-14		43	GEOGRAPHY/CARTOGRAPHY: South Australia, Lake Eyre Basin. (Dark) GEOLOGY/HYDROLOGY: Low interior plains with numerous dry lakes and alkali deposits. FORESTRY: Predominantly desert shrubform and grass. METEOROLOGY: Cumulus, alto-cumulus.
1904	116	10/19			17:00	15°	24°30'S	152°00'E*					25	METEOROLOGY: Cumulus, cirrus.
1905	117	10/19	Fall	184:50	10:07	49°	22°24'N	32°56'E			J-5			GEOGRAPHY/CARTOGRAPHY: Nile River to Red Sea. (Dark) GEOLOGY/HYDROLOGY: Alluvial plain, plateau, intermittent dendritic drainage on the plateau. FORESTRY: Predominantly scattered desert shrubform, semi-dense vegetation along banks of Nile.
1906	117	10/19	Fall	184:50	10:09	51°	23°47'N	34°16'E			J-5		00	GEOGRAPHY/CARTOGRAPHY: Nile River to Red Sea. (Dark) GEOLOGY/HYDROLOGY: Alluvial plain, plateau, intermittent dendritic drainage on the plateau. FORESTRY: Scattered desert shrubform with semi-dense vegetation along Nile.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1907	117	10/19	Spring	185:15	15:52	30°	$24^\circ 31'$S	$113^\circ 11'$E	1:5,770,000		Q-12		25	GEOGRAPHY/CARTOGRAPHY: Shark Bay, Western Australia. (Normal) GEOLOGY/HYDROLOGY: Coastal plain, hills in the interior, intermittent stream, dendritic drainage. FORESTRY: Primarily shrubform with grass. METEOROLOGY: Cumulus. OCEANOGRAPHY: Depth differences along the coastline.
1908	117	10/19	Spring	185:16	15:52	30°	$21^\circ 45'$S	$113^\circ 49'$E	1:15,200,000		P-12	173.9	22	GEOGRAPHY/CARTOGRAPHY: Exmouth Gulf, Western Australia. (Dark) GEOLOGY/HYDROLOGY: Coastal plain with intermittent consequent drainage patterns. FORESTRY: Scattered shrubform changing to dense shrub. METEOROLOGY: Small cumulus.
1909	118	10/19	Spring	186:51	15:50	09°	$25^\circ 35'$S	$113^\circ 38'$E	1:7,045,000		Q-12		32	GEOGRAPHY/CARTOGRAPHY: Shark Bay, Western Australia. (Dark) GEOLOGY/HYDROLOGY: Coastal plain region containing low hills and intermittent consequent drainage. FORESTRY: Grass and scattered shrubform changing to semi-dense forest lands to the south. METEOROLOGY: Cumulus. OCEANOGRAPHY: Coastal shallows.
1910	118	10/19	Spring	186:51	15:56	08°	$27^\circ 27'$S	$114^\circ 15'$E	1:7,333,330		Q-12		20	GEOGRAPHY/CARTOGRAPHY: Shark Bay, Western Australia. (Dark) AGRICULTURE: Extensive field patterns to south. GEOLOGY/HYDROLOGY: Coastal plain region containing low hills and intermittent consequent drainage. FORESTRY: Grass and scattered shrubform. METEOROLOGY: Cumulus. OCEANOGRAPHY: Coastal shallows.
1911	120	10/19	Hot-Wet	189:36	13:31	64°	$10^\circ 04'$S	$12^\circ 41'$E	1:3,750,000		N-3		63	GEOGRAPHY/CARTOGRAPHY: Angola, coast at Luanda. (Normal) GEOLOGY/HYDROLOGY: Plateau, narrow coastal plain. FORESTRY: Intermittent tall savanna grass. METEOROLOGY: Cumulus, alto-cumulus.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINCIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1912	120	10/19	Spring	189:40	13:33	48°	$17^{\circ}45'$S	$27^{\circ}11'$E	1:6,680,000		P-4		38	GEOGRAPHY/CARTOGRAPHY: Zambia, Rhodesia, Lake Kariba. (Normal) GEOLOGY/HYDROLOGY: Volcanic highlands, plateau. FORESTRY: Intermittent forest and savanna grassland. METEOROLOGY: Cumulus.
1913	120	10/19	Spring	189:42	15:05	40°	$19^{\circ}32'$S	$34^{\circ}54'$E	1:4,285,700		P-5		20	GEOGRAPHY/CARTOGRAPHY: Mozambique, coast of Beira. (Dark) GEOLOGY/HYDROLOGY: Coastal plain, plateau in the interior. FORESTRY: Mangrove swamps, intermittent rain forests and grasslands, several smoke plumes. METEOROLOGY: Cumulus. OCEANOGRAPHY: Ocean depth variations or sediment.
1914	120	10/19	Spring	189:42	15:05	39°	$18^{\circ}55'$S	$36^{\circ}07'$E	1:4,285,700		P-5		16	GEOGRAPHY/CARTOGRAPHY: Mozambique, coast at mouth of Zambezi River. (Dark) GEOLOGY/HYDROLOGY: Delta, coastal plain and plateau. FORESTRY: Mangrove swamps, intermittent rain forests and savanna grasslands, numerous fires. METEOROLOGY: Cumulus. OCEANOGRAPHY: Ocean depth variations or sediments.
1915	120	10/19											00	Underexposed.
1916	120	10/19	Fall	190:45	07:42	19°	$31^{\circ}56'$N	$91^{\circ}45'$W			H-24		00	GEOGRAPHY/CARTOGRAPHY: Alexandria, Louisiana; Jackson, Mississippi; transportation network. (Dark) AGRICULTURE: Extensive cultivation. GEOLOGY/HYDROLOGY: Flood plain, meandering Mississippi River. FORESTRY: Pine-hardwood forests and scattered bottom land hardwoods in river plain.
1917	120	10/19	Fall	190:45	07:47	20°	$30^{\circ}27'$N	$90^{\circ}14'$W	1:3,208,330		H-24		2	GEOGRAPHY/CARTOGRAPHY: New Orleans, Louisiana; regional transportation network. (Dark) AGRICULTURE: Extensive cultivation pattern. GEOLOGY/HYDROLOGY: Flood plain, Mississippi River. FORESTRY: Intermittent coastal marsh and mixed forest stands.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1918	120	10/19	Fall	190:45	07:58	22°	$31^\circ06'$N	$87^\circ03'$W	1:3,280,000		H-24		00	GEOGRAPHY/CARTOGRAPHY: Mobile, Alabama; regional transportation network. (Dark) AGRICULTURE: Scattered, intense cultivation. GEOLOGY/HYDROLOGY: Coastal plain. FORESTRY: Intermittent coastal marsh vegetation with mixed pine-hardwood forests. OCEANOGRAPHY: Sediment flows into Gulf from Bay.
1919	120	10/19	Fall										100	METEOROLOGY: Hurricane Gladys, Gulf of Mexico.
1920	122	10/19	Hot-Wet	192:37	13:24	66°	$05^\circ30'$S	$35^\circ10'$W			M-28		52	GEOGRAPHY/CARTOGRAPHY: Brazil, Natal, Cabo de Sao Raque. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. FORESTRY: Intermittent dense tropical forests. METEOROLOGY: Cumulus.
1921	122	10/19	Spring	192:51	17:18	10°	$30^\circ00'$S	$21^\circ00'$E*	1:9,666,700		Q-4		14	GEOGRAPHY/CARTOGRAPHY: South Africa, Southwest Africa, Orange River. (Normal) GEOLOGY/HYDROLOGY: Narrow coastal plain, complex mountains, complex plateau. METEOROLOGY: Cirrus.
1922	122	10/19	Spring	192:51	17:14	11°	$32^\circ00'$S	$20^\circ00'$E*	1:5,000,000		R-4		50	GEOGRAPHY/CARTOGRAPHY: South Africa, St. Halen Bay Cape Columbine, Capetown. (Dark) GEOLOGY/HYDROLOGY: Folded mountains and complex plateau. FORESTRY: Low shrubform, grassland. METEOROLOGY: Cumulus, cirrus.
1923	123	10/19		194:07	12:58	72°	$02^\circ00'$S	$63^\circ00'$W*			N-28		98	METEOROLOGY: Cumulus, cirrus. (Normal)
1924	123	10/19	Hot-Wet	194:14	14:45	48°	$13^\circ00'$S	$38^\circ00'$W*	1:5,500,000		P-28 N-28		29	GEOGRAPHY/CARTOGRAPHY: Brazil, Bahia State, Salvador. (Dark) GEOLOGY/HYDROLOGY: Coastal plain, complex plateau. FORESTRY: Dense tropical forest. METEOROLOGY: Cumulus, cirrus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1925	123	10/19	Hot-Wet	194:14	14:45	48°	15°30'S	38°00'W*	1:5,550,000		P-28		24	GEOGRAPHY/CARTOGRAPHY: Brazil, Bahia State, mouth of Jequitinhouhas. GEOLOGY/HYDROLOGY: Coastal plain with perennial drainage. FORESTRY: Dense tropical forests. METEOROLOGY: Cumulus, cirrus.
1926	124	10/19	Spring	195:42	14:13	54°	19°00'S	68°00'W*					88	GEOGRAPHY/CARTOGRAPHY: Chile, Argentina, Saler de Uyuni. METEOROLOGY: Alto-cumulus, thick cirrus.
1927	124	10/19	Spring	195:49	15:40	32°	24°57'S	47°23'W	1:5,172,400		Q-28		22	GEOGRAPHY/CARTOGRAPHY: Brazil coastline, Santos to Florianopalos. (Dark) GEOLOGY/HYDROLOGY: Coastal plain. FORESTRY: Dense forest. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Some sediment deposition.
1928	124	10/19	Hot-Wet	195:48	15:48	32°	24°00'S	46°00'W*	1:5,000,000		P-28		25	GEOGRAPHY/CARTOGRAPHY: Brazil coastline, Paruibe, Santos, Ponta de Juatinga. (Dark) AGRICULTURE: Possible field patterns. GEOLOGY/HYDROLOGY: Complex hills, coastal plain. FORESTRY: Dense forests along coast becoming increasingly intermittent inland. OCEANOGRAPHY: Depth differences.
1929	127	10/20		201:23		35°							100	METEOROLOGY: Typhoon Gloria.
1930	127	10/20		201:23									97	METEOROLOGY: Typhoon Gloria.
1931	129	10/20		204:47	14:56	42°	20°21'S	166°15'E	1:4,307,700		P-16	150	28	GEOGRAPHY/CARTOGRAPHY: New Caledonia, Ile Lifou. (Dark) GEOLOGY/HYDROLOGY: Complex mountains. FORESTRY: Dense forest. METEOROLOGY: Cumulus. OCEANOGRAPHY: Reefs, sun-glint.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1932	133	10/20	Cool-Dry	210:31	10:34	62°	13°20'N	14°43'E	1:3,700,000		K-3		20	GEOGRAPHY/CARTOGRAPHY: Lake Chad, Africa. (Dark) GEOLOGY/HYDROLOGY: Interior plain region forming a drainage basin with elevated dunes on the north side. FORESTRY: Savanna grassland, with scattered shrubform. METEOROLOGY: Cirrus.
1933	134	10/20	Fall	213:19	06:46	09°	Above Horizon				H-25	120		GEOGRAPHY/CARTOGRAPHY: Florida. (Dark) OCEANOGRAPHY: Sun-glint.
1934	134	10/20	Fall	213:19	07:05	11°	27°30'N	81°30'W			H-25	120	18	GEOGRAPHY/CARTOGRAPHY: Florida. (Dark) METEOROLOGY: Clouds, the horizon. OCEANOGRAPHY: Sun-glint.
1935	134	10/20	Fall	213:20	07:02	11°	28°25'N	79°49'W			H-25	118	30	GEOGRAPHY/CARTOGRAPHY: Florida, KSC. (Dark) METEOROLOGY: Cumulus, cirrus.
1936		10/20	Fall						1:7,000,000		J-26		34	GEOGRAPHY/CARTOGRAPHY: Cuba, Havana. (Dark) GEOLOGY/HYDROLOGY: Low plain. FORESTRY: Intermittent forest lands. METEOROLOGY: Cumulus, cirrus.
1937	136	10/20	Fall	216:22	07:45	20°	30°00'N	115°00'W*			H-22	112	65	GEOGRAPHY/CARTOGRAPHY: Gulf of California, Isle Tiburon and Isle Angel de la Guarda. (Dark) METEOROLOGY: Strato-cumulus.
1938	136	10/20	Fall	216:24	08:11	26°	25°30'N	109°00'W*			H-22 H-23 J-24	106	2	GEOGRAPHY/CARTOGRAPHY: Southern end of the Gulf of California and Southwestern Mexico coast. (Dark) GEOLOGY/HYDROLOGY: Coastal plain showing off shore build-up on a shoreline of submergence. OCEANOGRAPHY: Sun-glint, good land/water contrast.
1939	137	10/20	Spring	216:44	13:23	67°	10°00'S	36°00'W*				112	12	GEOGRAPHY/CARTOGRAPHY: Brazil, coast near Aracju. (Normal) GEOLOGY/HYDROLOGY: Coastal plain. METEOROLOGY: Cumulus. OCEANOGRAPHY: Coastal shallows.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1940	137	10/20	Spring	217:00	17:12	11°	$28^{\circ}00'S$	$16^{\circ}53'E$	1:5,500,000		Q-4	180	40	GEOGRAPHY/CARTOGRAPHY: South Africa, Orange River. (Dark) GEOLOGY/HYDROLOGY: Complex plateau. METEOROLOGY: Cumulus.
1941	140	10/20	Spring	221:29	17:00	15°	$29^{\circ}00'S$	$53^{\circ}00'W$			Q-28	172	10	GEOGRAPHY/CARTOGRAPHY: Porto Alegre, Brazil, South Atlantic Ocean. (Normal) GEOLOGY/HYDROLOGY: Coastal plain. FORESTRY: Intermittent forest and grassland. METEOROLOGY: Cumulus.
1942	140	10/20	Spring	221:29	17:13	12°	$31^{\circ}00'S$	$50^{\circ}30'W$	1:5,000,000		Q-28	175	8	GEOGRAPHY/CARTOGRAPHY: Porto Alegre, Brazil, South Atlantic Ocean. (Normal) AGRICULTURE: Some cultivation around Lagoa dos Patos. GEOLOGY/HYDROLOGY: Coastal plain, swamp. FORESTRY: Low shrubform. METEOROLOGY: Cumulus, cirrus.
1943	140	10/20	Spring	221:30	17:11	12°	$31^{\circ}48'S$	$51^{\circ}50^{\circ}W$	1:5,000,000		Q-28	180	13	GEOGRAPHY/CARTOGRAPHY: Porto Alegre, Brazil, South Atlantic Ocean. (Normal) GEOLOGY/HYDROLOGY: Coastal plain, swamp, sediment flow patterns in lagoon. FORESTRY: Low shrubform. METEOROLOGY: Cumulus, cirrus. OCEANOGRAPHY: Off shore sediment flows.
1979	8	10/12	Fall	11:59	08:46	32°	$30^{\circ}20'N$	$86^{\circ}23'E$			H-9	125	5	GEOGRAPHY/CARTOGRAPHY: India, Nepal, Tibet, Gorakhpur in India; Ghaghra and Gandak Rivers, Ganges Plains, Himalayas. (Normal) GEOLOGY/HYDROLOGY: Ganges interior alluvial plains and basement complex of the Himalayas. The complex Tibet Plateau is in the background, perennial rivers form a braided pattern along the plains. FORESTRY: Savanna grass mixed with deciduous forest stands in flood plain, changing to dense evergreen forest at middle elevations and void of vegetation at higher elevations. METEOROLOGY: Alto-cumulus.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT LATITUDE	PRINICIPAL POINT LONGITUDE	APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS WAC	MAP PLOTS ONC	ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
		1968												
1980	8	10/12	Fall	11:59	08:43	34°	25°52'N	85°20'E			H-9	125	10	GEOGRAPHY/CARTOGRAPHY: India, Nepal, Tibet, Pakistan, Patma City, Gaya in India: Ghaghra, Gandak, Son and Ganges River: Ganges Plains and Himalayas. (Normal) AGRICULTURE: Field patterns recognizable in flood plain. GEOLOGY/HYDROLOGY: Ganges interior alluvial plain and basement complex of the Himalayas. The Ganges River is a perennial braided river. FORESTRY: Savanna grass, semi-dense forests with occasional dense stands in flood plain, changing to dense evergreen stands at higher elevation. METEOROLOGY: Small cumulus, alto-cumulus.
1981	8	10/12	Fall	12:00	08:55	34°	27°49'N	88°01'E			H-9	125		GEOGRAPHY/CARTOGRAPHY: Nepal, India, China, Bhutan, Himalayas and Tibet Plateau. (Normal) GEOLOGY/HYDROLOGY: Complex of Himalayas consisting of igneous and sedimentary rocks, Tibet plateau is highly disected and forms a complex plateau with alluvial deposits. FORESTRY: Dense forest stands along plain and highland contact and up to snow line. Vegetation sparse or lacking in plateau. METEOROLOGY: Alto-cumulus, strato-cumulus.
1982	8		Fall	12:00	09:03	35°	28°08'N	90°11'E			H-10	126		GEOGRAPHY/HYDROLOGY: Bhutan, China, Himalayas and Tibet Plateau. (Normal) GEOLOGY/HYDROLOGY: Complex mountains of the Himalayas and Tibet Plateau complex. FORESTRY: Dense to semi-dense forest stands below snow line, vegetation sparse or lacking in plateau. METEOROLOGY: Cumulus, alto-cumulus.
1983	8		Fall	12:10	11:54	49°	32°12'N	130°15'N	1:4,000,000		H-13	125	23	GEOGRAPHY/CARTOGRAPHY: Japan: Kyushu: Kagoshima; Kagoshima Bay, East China Sea. (Normal) AGRICULTURE: Sparse, irregular cultivation patterns. GEOLOGY/HYDROLOGY: Complex hills and submerged coast line. FORESTRY: Dense forest stands on slopes, separated by drainage system. METEOROLOGY: Cirrus, alto-cumulus, small cumulus. OCEANOGRAPHY: Off shore sedimentation.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1984	8		Fall	12:10	11:55	49°	31°25'N	130°41'E	1:3,452,000		H-13	125	40	GEOGRAPHY/CARTOGRAPHY: Japan: Kyushu, Kagoshima, Miyakonojo, Kagoshima Bay, East China Sea. (Normal) GEOLOGY/HYDROLOGY: Complex hills and submerged coast line. FORESTRY: Dense forest stands separated by drainage system. METEOROLOGY: Cirrus, alto-cumulus, small cumulus. OCEANOGRAPHY: Off shore sedimentation and currents are sparse.
1985	8	10/12	Fall	12:10	11:58	49°	31°01'N	131°06'E				125	72	GEOGRAPHY/CARTOGRAPHY: Japan: Kyushu: Kagoshima, Kagoshima Bay. (Normal) GEOLOGY/HYDROLOGY: Complex hills and submerged coast line. FORESTRY: Dense forest stands separated by drainage network. METEOROLOGY: Small cumulus, cumulus-nimbus.
1986	8	10/12											30	METEOROLOGY: Strato-cumulus. (Normal)
1987	9	10/12	Cool-Dry	13:22	07:18	20°	12°40'N	43°25'E*				129	20	GEOGRAPHY/CARTOGRAPHY: Ethiopia, Yemen, Somaliland, Saudi Arabia, Red Sea, Gulf of Aden. (Dark) METEOROLOGY: Small cumulus.
1988	9	10/12	Fall	13:22	07:13	18°	16°20'N	42°10'E*				129	0	GEOGRAPHY/CARTOGRAPHY: Yemen, Saudi Arabia: Red Sea, Farasan Islands. (Normal)
1989	9	10/12	Fall	13:23	07:21	19°	18°00'N	44°00'E*				130	0	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia: Empty Quarter, Jebel Tuwayq. (Normal) GEOLOGY/HYDROLOGY: Erg Plains region of longitudinal seif dunes.
1990	9	10/12	Fall	13:25	08:28	27°	30°00'N	60°00'E*				128	30	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Persian Gulf. (Normal) GEOLOGY/HYDROLOGY: Erg plains and eroding coast. METEOROLOGY: Small cumulus, alto-cumulus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1991	9	10/12	Fall	13:33	10:04	42°	30°30'N	82°00'E*				126		GEOGRAPHY/CARTOGRAPHY: India, Nepal, Tibet, Himalayas. (Dark) GEOLOGY/HYDROLOGY: Basement complex mountains of the Himalayas, perennial lakes from snow deposits are prevalent.
1992	9	10/12	Fall	13:33	10:04	42°	30°45'N	81°50'E			H-9 G-7	126	5	GEOGRAPHY/CARTOGRAPHY: Tibet: Tibet Plateau, Himalayas. (Dark) GEOLOGY/HYDROLOGY: Complex sedimentary Tibet Plateau and basement complex mountains of the Himalayas and perennial lakes.
1993	9	10/12	Fall	13:34	10:24	45°	30°43'N	86°45'E	1:4,000,000		H-9	125	35	GEOGRAPHY/CARTOGRAPHY: Tibet, Tibet Plateau, Terinam Tsho Lake. (Dark) GEOLOGY/HYDROLOGY: Perennial lakes and complex plateau of Tibet. METEOROLOGY: Cirrus, small cumulus, alto-cumulus.
1994	9	10/12												Spacecraft window
1995	9	10/12												Blurred photo.
1996	9	10/12	Cool-Dry	13:56	06:09	21°	11°00'N	167°30'E*				138	20	GEOGRAPHY/CARTOGRAPHY: Marshall Islands, Ailimginae and Rongelap Atolls. METEOROLOGY: Small cumulus, towering cumulus. OCEANOGRAPHY: Currents are parallel to Atolls.
1997	9	10/12	Cool-Dry	13:56	06:27	18°	7°00'N	172°00'E*				138	15	GEOGRAPHY/CARTOGRAPHY: Marshall Islands, Majuro, Arno, Mili Atolls. (Normal) METEOROLOGY: Small cumulus, towering cumulus. OCEANOGRAPHY: Currents are parallel to Atolls.
1998	10	10/12	Fall	14:53	07:28	21°	17°30'N	23°00'E			J-4	132	0	GEOGRAPHY/CARTOGRAPHY: Chad, Sudan, Libya, Enmedi Plateau, Mourdi Depression. (Normal) GEOLOGY/HYDROLOGY: Elevated sedimentary plateau surrounded by an interior erg plains region and highly dissected intermittent stream beds within the plateau.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
1999	10	10/12	Fall	14:55	08:08	28°	$22^{\circ}15'$N	$32^{\circ}00'$E			J-S	130		GEOGRAPHY/CARTOGRAPHY: United Arab Republic, Nile River, Lake Nassar, Wadi Halfa, Nubian Desert. (Normal) GEOLOGY/HYDROLOGY: Erg plain with a dissected sedimentary plains region adjacent to the Nile River. FORESTRY: Scattered desert shrubform.
2000	10	10/12	Fall	14:56	08:25	27°	$28^{\circ}25'$N	$34^{\circ}15'$E			H-5	129	0	GEOGRAPHY/CARTOGRAPHY: United Arab Republic, Israel, Saudi Arabia, Red Sea, Gulf of Suez, Gulf of Aqaba, Mediterranean Sea. (Normal) GEOLOGY/HYDROLOGY: A region of basement complex mountainous areas adjacent to the coastal erg areas of the rift zone, numerous fault structures can be delineated.
2001	10	10/12	Fall	14:57	08:36	32°	$24^{\circ}30'$N	$37^{\circ}00'$E*			J-6	128	5	GEOGRAPHY/CARTOGRAPHY: Saudi Arabia, Red Sea, Ras Abu Madd. (Normal) GEOLOGY/HYDROLOGY: Coastal plain dune deposits and basement complex highly fractured hills and mountains. FORESTRY: Low scattered shrubform. METEOROLOGY: Small cumulus.
2002	10	10/12	Fall	15:02	09:27	39°	$29^{\circ}00'$N	$50^{\circ}30'$E*			H-6	126		GEOGRAPHY/CARTOGRAPHY: Iran, Persian Gulf Coast at Bushire. (Normal) GEOLOGY/HYDROLOGY: Rugged hills of basement complex are adjacent to the coast. OCEANOGRAPHY: Coastal shallows, possible current patterns.
2003	11	10/12	Fall	16:33	09:48	41°	$31^{\circ}10'$N	$33^{\circ}10'$E*			H-5	126		GEOGRAPHY/CARTOGRAPHY: United Arab Republic, Israel, Nile Delta, Suez Canal. (Dark) GEOLOGY/HYDROLOGY: Deltaic plain of the Nile and emergent coast line of the Mediterranean. METEOROLOGY: Small cumulus, towering cumulus.
2004	11	10/12												METEOROLOGY: Strato-cumulus. (Dark)
2005	13	10/12		19:34	11:21	43°	$30^{\circ}00'$N	$11^{\circ}00'$E*				125		GEOGRAPHY/CARTOGRAPHY: Morocco. METEOROLOGY: Small cumulus, alto-cumulus.

*Approximate.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
2006	13	10/12	Fall	19:41	12:46	47°	$31^\circ 00'$N	$30^\circ 30'$E			H-5	126		GEOGRAPHY/CARTOGRAPHY: United Arab Republic, Israel, Nile Delta. (Dark) AGRICULTURE: *Extremely heavy cultivation in Nile delta.* GEOLOGY/HYDROLOGY: Coastal plain deposits from erg area. METEOROLOGY: Cumulus, alto-cumulus.
2007	13	10/12	Fall	19:42	12:48	48°	$32^\circ 00'$N	$33^\circ 00'$E*			G-3,4 H-5	126	25	GEOGRAPHY/CARTOGRAPHY: United Arab Republic, Israel, Jordan, Mediterranean Sea and Suez Canal. (Dark) AGRICULTURE: Extremely heavy cultivation in delta. GEOLOGY/HYDROLOGY: Deltaic coastal plain and erg desert coastal region. METEOROLOGY: Cumulus.
2008	13	10/12	Fall	19:42	12:46	47°	$30^\circ 08'$N	$32^\circ 38'$E	1:4,444,444		H-5	126	2	GEOGRAPHY/CARTOGRAPHY: United Arab Republic, Israel, Sinai Desert, Suez Canal, Gulf of Suez, Port Said, Ismailiya. (Dark) AGRICULTURE: Heavy cultivation in delta. GEOLOGY/HYDROLOGY: Dissected sedimentary hills and erg plains region. Perennial and intermittent drainage on the coasts. METEOROLOGY: Small cumulus.
2009	13	10/12	Fall	19:42	12:46	46°	$31^\circ 30'$N	$32^\circ 20'$E			H-5	127	15	GEOGRAPHY/CARTOGRAPHY: United Arab Republic, Israel, Sinai Desert, Suez Canal, Great Bitter Lake. (Dark) AGRICULTURE: Heavy cultivation in delta. GEOLOGY/HYDROLOGY: Coastal plain dune deposits. METEOROLOGY: Cumulus.
2010	13	10/12	Fall	19:43	12:57	45°	$31^\circ 15'$N	$35^\circ 15'$E			H-5	127	12	GEOGRAPHY/CARTOGRAPHY: Israel, Jordan, Syria, Lebanon, Dead Sea. (Dark) GEOLOGY/HYDROLOGY: Area of sedimentary hills and basement complex mountain structures grading into an alluvial plain. Dead Sea forms a watershed for Israel and Jordan. METEOROLOGY: Small cumulus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
2011	13	10/12	Fall	19:43	12:56	47°	$29^{\circ}37'$N	$35^{\circ}02'$E	1:3,545,454		H-5	127	5	GEOGRAPHY/CARTOGRAPHY: Israel, Jordan, Saudi Arabia, Gulf of Aqaba. (Normal) GEOLOGY/HYDROLOGY: Sedimentary and basement complex hill and mountains, with alluvial deposits interspersed. METEOROLOGY: Cumulus.
2012	14	10/12	Fall	21:05	11:08	52°	$28^{\circ}00'$N	$15^{\circ}00'$W*			H-1	125	20	GEOGRAPHY/CARTOGRAPHY: Canary Islands, Morocco, Atlantic Ocean. (Dark) GEOLOGY/HYDROLOGY: Volcanic, sedimentary and complex hills and the western Sahara Desert erg area of Morocco. FORESTRY: Dense intermittent forest stands on islands. METEOROLOGY: Cumulus, alto-cumulus.
2013	14	10/12	Fall	21:06	11:27	51°	$30^{\circ}00'$N	$10^{\circ}30'$W*			H-1	125	40	GEOGRAPHY/CARTOGRAPHY: Morocco, Ras Rhir, Anti-Atlas Mountains. (Dark) GEOLOGY/HYDROLOGY: Highly folded sedimentary mountain complex with alluvial deposits in the lower regions. FORESTRY: Scattered desert shrubform. METEOROLOGY: Strato-cumulus, small cumulus.
2014		10/12	Fall										95	METEOROLOGY: Strato-cumulus, small cumulus. (Dark)
2015	15	10/12	Fall	23:56	08:29	31°	$24^{\circ}30'$N	$97^{\circ}30'$W*				127	35	GEOGRAPHY/CARTOGRAPHY: Mexico, Tamaulipas, Laguna Madre Southern end. (Dark) GEOLOGY/HYDROLOGY: Coastal plain deposits along a shoreline of emergence, off shore sand bar. METEOROLOGY: Cumulus, cumulus-nimbus.
2016	15	10/12	Fall	24:00	09:37	41°	$28^{\circ}00'$N	$82^{\circ}40'$W			H-25	126	55	GEOGRAPHY/CARTOGRAPHY: Florida, Tampa, St. Petersburg, Gulf of Mexico. (Dark) METEOROLOGY: Small cumulus, towering cumulus.
2017	15	10/12	Fall	24:01	09:42	42°	$28^{\circ}20'$N	$80^{\circ}30'$W			H-25	126	85	GEOGRAPHY/CARTOGRAPHY: Florida, Ponce de Leon Inlet, East Coast, Cape Kennedy. (Dark) METEOROLOGY: Small cumulus, towering cumulus.

*Approximate

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
2018	15	10/12	Fall	24:01	09:40	41°	29°00'N	81°00'N			H-25	126	60	GEOGRAPHY/CARTOGRAPHY: Florida, Flagler Beach to Melborne, Cape Kennedy. (Dark) METEOROLOGY: Small cumulus, towering cumulus.
2019	17	10/12	Fall	27:02	10:09	40°	34°21'N	120°22'W			G-18	125	45	GEOGRAPHY/CARTOGRAPHY: California, Santa Cruz, San Miguel,and Santa Rosa Island, Santa Barbara, Santa Ynes Mountains, Pacific Ocean. (Normal) GEOLOGY/HYDROLOGY: Alluvial coastal plain and complex mountain structure. FORESTRY: Scattered desert shrubform with intermittent forests at higher elevations. METEOROLOGY: Cirrus underlined by cumulus.
2020	17	10/12	Fall	27:02	10:09	41°	34°08'N	119°09'W			G-18	125	35	GEOGRAPHY/CARTOGRAPHY: California, Los Angeles, Oceanside, Point Arquello, Mojave Desert, Santa Ynes and San Rafael Mts., Pacific Ocean. (Normal) AGRICULTURE: Extensive cultivation patterns, possible irrigation. GEOLOGY/HYDROLOGY: Pacific sedimentary and basement complex mountains. Mojave Desert plain and San Jaoquin valley bordered by folded mountain complexes. FORESTRY: Desert shrubform with intermittent forest stands at higher elevations. METEOROLOGY: Strato-cumulus, alto-cumulus.
2021	17	10/12	Fall	27:03	10:13	42°	32°58'N	118°25'W			G-18 H-22	125	45	GEOGRAPHY/CARTOGRAPHY: California, Santa Barbara, Los Angeles, Oceanside, Pacific Mountain Ranges, Mojave Desert, Pacific Ocean. (Normal) AGRICULTURE: Isolated areas of cultivation. GEOLOGY/HYDROLOGY: Folded coastal range mountains and Mojave desert plain with large dry salt lake deposits. FORESTRY: Desert shrubform with intermittent forest stands at higher elevations. METEOROLOGY: Cumulus, strato-cumulus.
2022	17	10/12	Fall	27:03	10:13	42°	34°57'N	117°41'W			G-18	125	30	GEOGRAPHY/CARTOGRAPHY: California, Los Angeles to Oceanside, San Gabriel Mountains, Mojave Desert, San Joaquin Valley. (Normal) AGRICULTURE: Extensive irrigated field patterns. GEOLOGY/HYDROLOGY: Complex folded Pacific Mountain, basin and range province and numerous dry salt lake regions. The sedimentary Pacific range contains both perennial and intermittent streams.

TABLE A-II.- SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												FORESTRY: Desert shrubform with intermittent forest stands at higher elevations. METEOROLOGY: Cirrus, strato-cumulus.
2023	17	10/12	Fall	27:03	10:24	43°	$33^\circ16'$N	$115^\circ36'$W	1:3,521,700		G-18	125	0	GEOGRAPHY/CARTOGRAPHY: California, Mexico, Baja California, Imperial Valley, Mexacali, Salton Sea, basin and range. (Normal) AGRICULTURE: Very extensive, irregular cultivation, field patterns easily recognizable. GEOLOGY/HYDROLOGY: Complex mountains, volcanic and alluvial deposits in the basin and range perennial Colorado River, intermittent streams and dry salt lake deposits. FORESTRY: Scattered desert shrubform. METEOROLOGY: Small isolated cumulus.
2024	17	10/12	Fall	27:03	10:34	46°	$31^\circ20'$N	$113^\circ00'$W			H-22	125	0	GEOGRAPHY/CARTOGRAPHY: Mexico, Arizona, Gulf of California, Sonora Desert, Tucson, Willcox Dry Lake, De Aquar Bay. (Normal) AGRICULTURE: Extensive cultivation, field patterns along Rio de la Concepcion. GEOLOGY/HYDROLOGY: Basin and range province, volcanic mountains, alluvial plains, Pinacates lava field, and lateral dune formations. FORESTRY: Scattered desert shrubform. OCEANOGRAPHY: Distinct currents and off shore sedimentation.
2025	17		Fall	27:04	10:30	45°	$31^\circ35''$N	$113^\circ54'$W			G-19 H-22	125	0	GEOGRAPHY/CARTOGRAPHY: Mexico, Arizona, Sonora Desert, Gulf of California, Rio Sonoyta, Rio de la Concepcion. (Normal) AGRICULTURE: Extensive cultivation along Rio de la Concepcion. GEOLOGY/HYDROLOGY: Basin and range province, Pinacates lava field, alluvial and dunal deposits, intermittent drainage is prevalent and sedimentation outflow from the Colorado River. FORESTRY: Scattered desert shrubform. OCEANOGRAPHY: Currents and off shore sedimentation.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
2026	17	10/12	Fall	27:04	10:34	45°	31°20;N	113°15'W	1:3,285,000		H-22	125	0	GEOGRAPHY/CARTOGRAPHY: Mexico, Arizona, Sonora Desert, Gulf of California, Rio de la Concepcion. (Normal) AGRICULTURE: Extensive cultivation along Rio de la Concepcion. GEOLOGY/HYDROLOGY: Basin and range province, volcanic and dune deposits. Deltaic plain and intermittent drainage. FORESTRY: Scattered desert shrubform. OCEANOGRPHY: Sediments in suspension and currents adjacent to coast.
2027	17	10/12	Fall	27:04	10:38	46°	29°20'N	112°00'W	1:5,385,000		H-22	125	5	GEOGRAPHY/CARTOGRAPHY: Mexico, Baja California, Isla Tiburon, Isla Angel de la Guarda, Guaymas, Hermosillo. (Normal) AGRICULTURE: Extensive cultivation in Sonora River delta. GEOLOGY/HYDROLOGY: Basement complex hills and mountains, Sonora plains and complex Sierra Madre Occidental. FORESTRY: Scattered desert shrubform. METEOROLOGY: Small cumulus. OCEANOGRAPHY: Sedimentation and currents along the coast. Sun-glint exposing surface activities.
2028	17	10/12	Fall	27:05	10:58	47°	31°00'N	107°40'W			H-23	125	5	GEOGRAPHY/CARTOGRAPHY: Mexico, New Mexico, Chimuahua, Laguna De Guzman, El Paso, Rio Grande. (Normal) AGRICULTURE: Scattered, intense cultivation along Rio Grande and in New Mexico. GEOLOGY/HYDROLOGY: Basin and range terrain, dry salt lake deposits, perennial and intermittent drainage. FORESTRY: Scattered desert shrubform with semi-dense evergreen stands at high elevations. METEOROLOGY: Small cumulus.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT LATITUDE	PRINICIPAL POINT LONGITUDE	APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS WAC	MAP PLOTS ONC	ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
		1968												
2029	17	10/12	Fall	27:06	11:05	47°	32°51'N	105°57'W			G-19	125	3	GEOGRAPHY/CARTOGRAPHY: New Mexico, White Sands, Alamogordo, Sacramento and San Andres Mountains, Pecos River. (Normal) AGRICULTURE: Intense field pattern along Pecos River at Roswell and Artesia New Mexico. GEOLOGY/HYDROLOGY: Complex sedimentary mountains, alluvial plains, alkali basin deposit and intermittent streams. FORESTRY: Scattered desert shrubform with mixed conifer-hardwood forests in Sacramento mountains. METEOROLOGY: Cumulus.
2030	17	10/12	Spring	27:06	11:11	47°	32°05'	104°48'W			G-19	125	3	GEOGRAPHY/CARTOGRAPHY: New Mexico, Texas, Carlsbad, Sacramento Mountains, Salt Flat. (Normal) AGRICULTURE: Intense along Pecos River. GEOLOGY/HYDROLOGY: Elevated alluvial plains, sedimentary mountains and intermittent drainage. FORESTRY: Scattered desert shrubform with mixed conifer-hardwood forests in Sacramento ranges. METEOROLOGY: Cumulus, towering cumulus.
2031	17	10/12	Fall	27:06	11:21	48°						124	30	GEOGRAPHY/CARTOGRAPHY: New Mexico, Texas, Roswell, Lubbock, Llano Estacado. (Normal) AGRICULTURE: Extensive cultivation, large rectangular field pattern. GEOLOGY/HYDROLOGY: Central basin platform, intermittent drainage. FORESTRY: Scattered to dense shrubform. METEOROLOGY: Cirrus, cumulus.
2032	17	10/12	Fall	27:07	11:17	49°	31°15'N	103°05'W			H-23	124	3	GEOGRAPHY/CARTOGRAPHY: New Mexico, Texas, Odessa, Monahans, Fort Stockton, central basin, platform. (Normal) AGRICULTURE: Scattered areas of intense cultivation. GEOLOGY/HYDROLOGY: Sedimentary plains and Edwards Plateau region. Drainage is intermittent throughout. FORESTRY: Scattered low shrubform. METEOROLOGY: Cumulus, towering cumulus.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV.	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	% CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
2033	17	10/12	Fall	27:08	11:57	50°	$30^\circ04'$N	$93^\circ45'$W			H-24	124	60	GEOGRAPHY/CARTOGRAPHY: Texas, Louisiana, Gulf Coast, Port Arthur, Lake Charles. (Normal) AGRICULTURE: Large areas of cultivation around Lake Charles. GEOLOGY/HYDROLOGY: Coastal plain of sedimentary beds. FORESTRY: Semi-dense to dense pine-hardwood forests. METEOROLOGY: Small cumulus. OCEANOGRAPHY: Sedimentation deposits along coast.
2034	17	10/12	Fall	27:09	12:00	50°	$29^\circ591$N	$93^\circ15'$W	1:4,100,000		H-24	124	45	GEOGRAPHY/CARTOGRAPHY: Texas, Louisiana, Orange, Lake Charles, Opelousas, coastal plain, Sabine Pass, Vermilion Bay. (Normal) AGRICULTURE: Extensive large percentage of land under cultivation. FORESTRY: Intermittent stands of mixed pine-hardwood forests. METEOROLOGY: Small cumulus. OCEANOGRAPHY: Sedimentation and current turbidity along the coast.
2035	17	10/12	Fall				$30^\circ03'$N	$93^\circ15'$W			H-24			GEOGRAPHY/CARTOGRAPHY: Louisiana, Lake Charles, Crowley, Grand and White Lakes. (Normal) AGRICULTURE: Extensive cultivation. FORESTRY: Intermittent stands of mixed pine-hardwood forests. METEOROLOGY: Small cumulus. OCEANOGRAPHY: Sedimentation along the coast.
2036	17	10/12	Fall	27:09	12:12	50°	$30^\circ14'$N	$89^\circ58'$W	1:3,666,000		H-24	124	75	GEOGRAPHY/CARTOGRAPHY: Louisiana, Mississippi, Biloxi, New Orleans, Lake Ponchartrain. (Normal) AGRICULTURE: Extensive cultivation. FORESTRY: Intermittent stands of pine bottom land hardwood forests. Coastal marsh grass. METEOROLOGY: Cumulus,cumulus-nimbus, alto-cumulus. OCEANOGRAPHY: Currents and possible depth anomalies.

TABLE A-II. - SCREENING INFORMATION LIST - Continued

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
2037	17	10/12	Fall	27:11	13:44	50°	27°55'N	82°40'W			H-25	124	65	GEOGRAPHY/CARTOGRAPHY: Florida, Tampa, Sarasota, Lakeland, St. Petersburg, Gulf Coast - coastal plain region. (Normal) AGRICULTURE: Scattered areas of semi-intense cultivation. FORESTRY: Intermittent stands of pine and bottom land hardwoods, coastal marsh grass. METEOROLOGY: Cumulus, alto-cumulus. OCEANOGRAPHY: Sun-glint and current changes are evident.
2038	17	10/12	Fall	27:12	12:53	48°	28°23'N	80°31'W	1:3,568,000		H-25	125	85	GEOGRAPHY/CARTOGRAPHY: New Smyrna, Palm Beach, Kennedy Space Center, Atlantic coastal plain. (Normal) AGRICULTURE: Scattered field patterns. FORESTRY: Intermittent stands of pine, coastal grass, bottom land shrubform. METEOROLOGY: Cumulus. OCEANOGRAPHY: Currents along the coast are evident.
2039	17		Fall	27:12	12:53	48°	28°35'N	80°30'W			H-25	125	85	GEOGRAPHY/CARTOGRAPHY: Florida, Titusville, Fort Pierce, Stuart, Kennedy Space Center, Atlantic coastal plain. (Normal) FORESTRY: Intermittent pine and bottom land hardwood low shrubform and coastal grass. METEOROLOGY: Cumulus. OCEANOGRAPHY: Currents are evident.
2040	18	10/12	Fall	27:13	13:05	48°	26°55'N	77°40'W	1:4,000,000		H-25	125	70	GEOGRAPHY/CARTOGRAPHY: Grand Bahama and Great Abaco Islands, Atlantic Ocean and Limean coral reefs. (Normal) FORESTRY: Dense stands of broad leaf evergreen. METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Bahama banks differentation is prevalent, to show depth difference.

TABLE A-II. - SCREENING INFORMATION LIST - Concluded

FRAME NUMBER	ORBIT	DATE	SEASON	GET	LOCAL SOLAR TIME	SUN ELEV	PRINICIPAL POINT		APPROXIMATE SCALES OF 70MM AT PP	MAP PLOTS		ALTITUDE N.M.	%CLOUDS	DESCRIPTION BY DISCIPLINE
							LATITUDE	LONGITUDE		WAC	ONC			
		1968												
2041	18	10/12	Fall	27:13	13:03	48°	$26^{\circ}55'$N	$77^{\circ}45'$W			H-25	125	80	GEOGRAPHY/CARTOGRAPHY: Grand Bahama and Great Abaco Islands, Window Reflection in the center. (Normal) METEOROLOGY: Cumulus, alto-cumulus, cirrus. OCEANOGRAPHY: Bahama banks differentation is prevalent for depth differences.
2042		10/12												Light specks
2043		10/12												Hatch window inside the spacecraft.

Figure A-1. - World Apollo Index Map, Western Hemisphere.

Figure A-2. - World Apollo Index Map, Near East.

Figure A-3. - World Apollo Index Map, Far East.

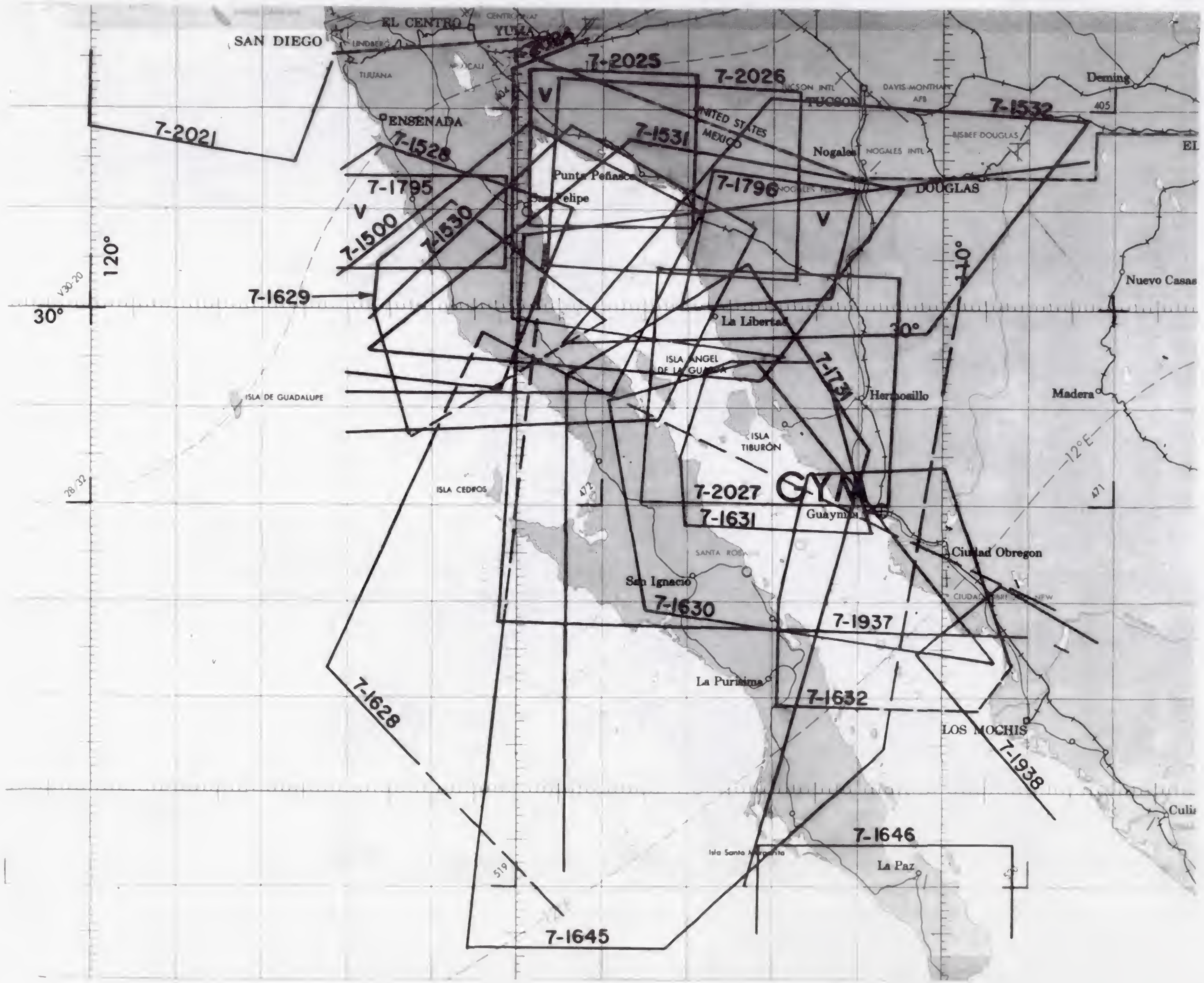


Figure A-4. - Apollo photographic coverage enlargement of Baja California area.

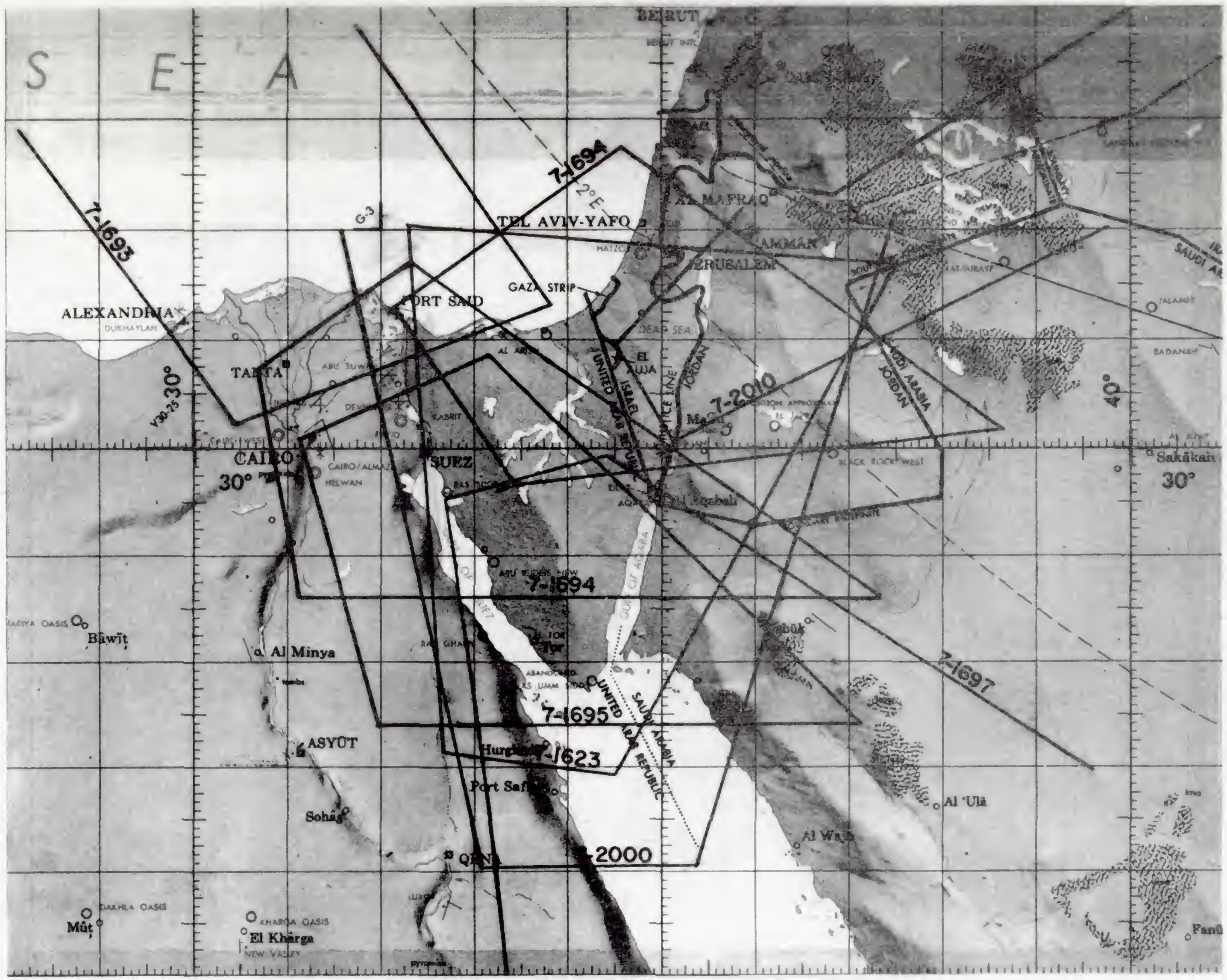


Figure A-5. - Apollo photographic coverage enlargement of Sinai Peninsula area.

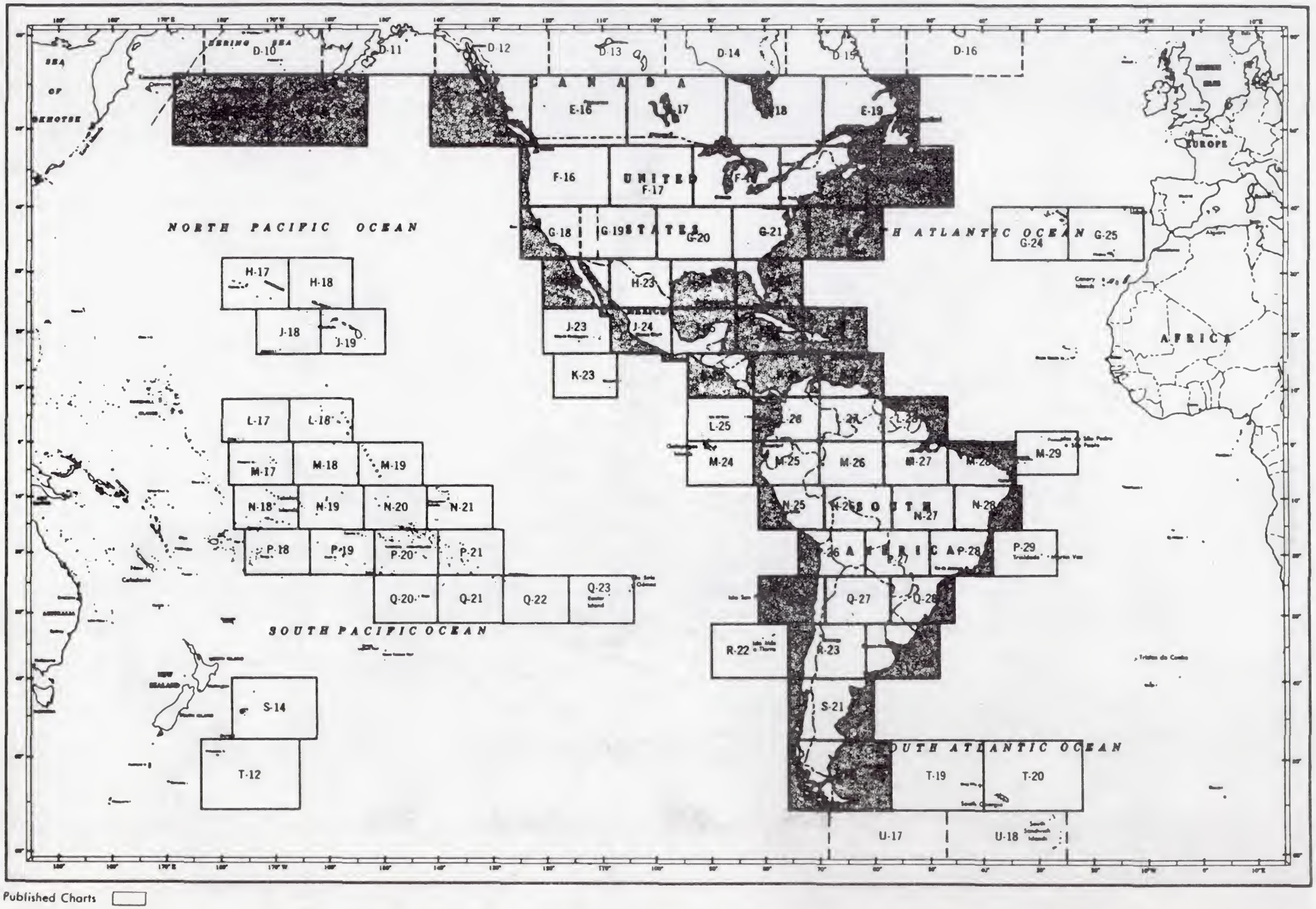
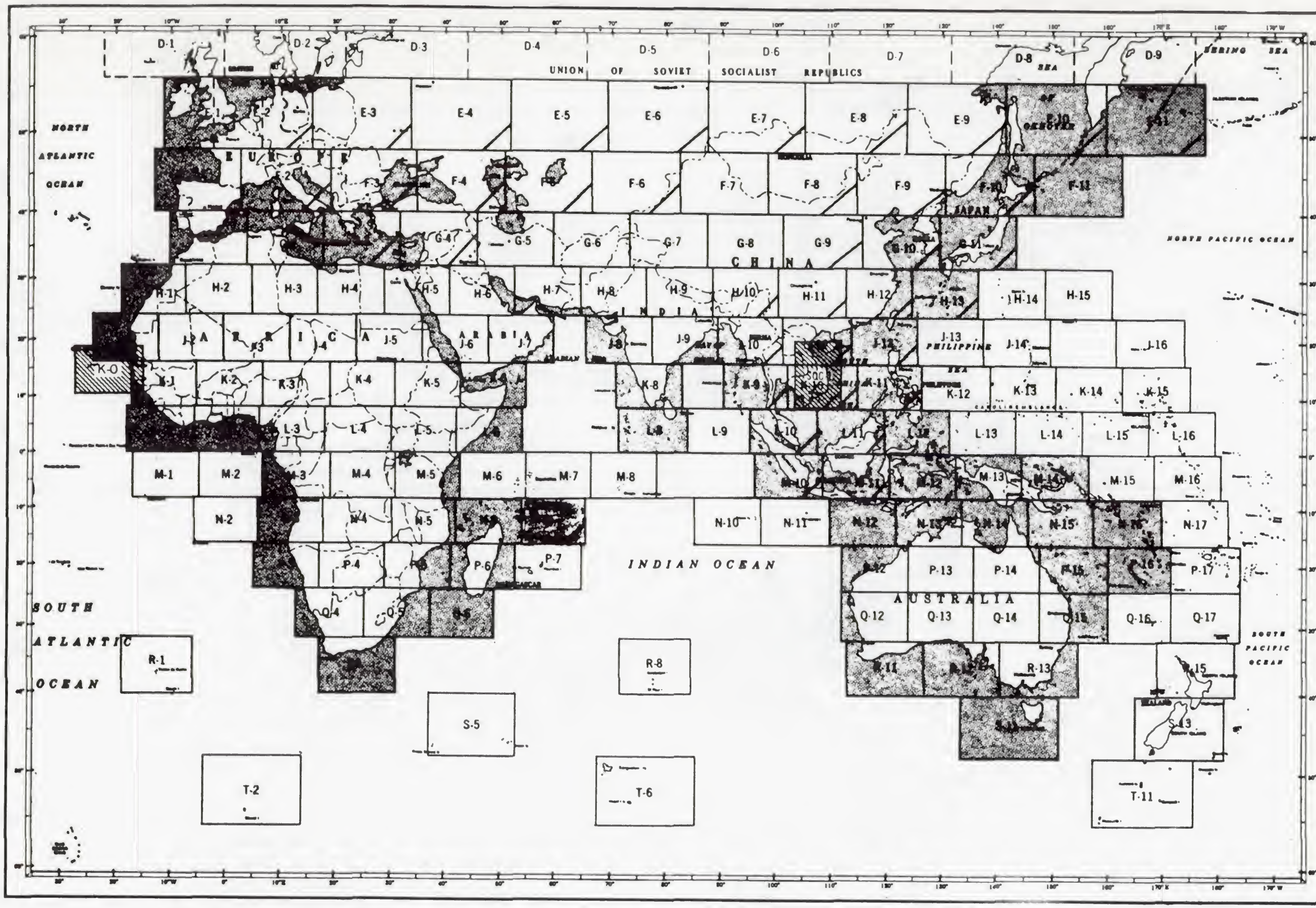


Figure A-6. - ONC Index of Western Hemisphere.



Available with Contour Evaluation Overprint

Figure A-7. - ONC Index of Eastern Hemisphere.

APPENDIX B

EARTH RESOURCES AIRCRAFT PROGRAM MISSION

PLAN FOR MISSION 981

Mission Notes

The test sites flown over in Mission 981 are shown in figure B-1, and the data are presented in tables B-I to B-IV.

Colorado River Area

The following notes were made concerning the Colorado River area (fig. B-2).

1. Lines 3 and 4 are first priority. Hasselblad coverage is required on line 1 only and is desired on all lines.

2. The photographic coverage is 60-percent forward overlap and 25-percent side overlap.

3. The objective is to map the delta bottom; settings should be made to enhance water penetration.

El Paso Area

The following notes were made concerning the El Paso area (fig. B-3).

1. The first 28 miles of line 1 is first priority.

2. The photographic coverage is 60-percent overlap; the altitude is 10 000 feet above the terrain to obtain 1:20, 000 RC-8 coverage.

3. The geological features of interest on line 1 are Eagles Nest, Mount Riley, and Hunt's Hole.

Tucson, Arizona Area

The following notes were made concerning the Tucson, Arizona area (fig. B-3).

1. It is desirable to fly line 1 during spacecraft overflight.

2. The photographic coverage is 60-percent overlap.

Dallas-Fort Worth Area

The following is the flight plan for the Dallas-Fort Worth area (fig. B-4).

Go 2 miles west of Interstate 35E from 2 miles south of Waxahachie, along Hampton Road through DeSoto to Dallas, over the Trinity River. Continue north over Love Field, along the east side of Marsh Lane to near Belt Line Road (west of Addison Airport). Aline west-southwest/east-northeast to pass over resolution targets at Addison Airport. Continue east approximately 2 miles north of Belt Line Road to railroad (G.C. & S.F.) east of Richardson. Continue south over White Rock Lake Park to Garland Road (State Highway 78), then southwest across Trinity River near the Interstate 35E bridge to U.S. Highway 80. Continue west 1 mile south of U.S. Highway 80 to the intersection of Interstate 820 (Lake Arlington) in Fort Worth. The following is the coverage:

12 000 feet above terrain
Ektachrome (60-percent overlap)
Ektachrome (60-percent overlap)
Multiband (10-percent overlap from Waxahachie to DeSoto and on east leg from Addison Airport to Richardson)

1. Navasota to Bryan (Bryan): one-half mile west of Highway 6 from Navasota to north edge of Bryan

Coverage: 12 000 feet above terrain
Ektachrome (60-percent overlap)
Ektachrome (60-percent overlap)
Multiband (two 10-percent overlap frames every 5 miles)

2. Eddy to West (Waco): one-half mile west of interstate 35 from Eddy (15 miles north-northeast of Temple) to West (16 miles north of Waco)

Coverage: 12 000 feet above terrain
Ektachrome (60-percent overlap)
Ektachrome (60-percent overlap)
Multiband (five 10-percent overlap frames north of Eddy and north of Waco)

3. Fisher County (Anson to Snyder): along U.S. Highway 180 from intersection of State Highway 126 at Boyds to Midway (12 miles east of Snyder)

Coverage: 12 000 feet above terrain
Ektachrome (60-percent overlap)
Ektachrome (60-percent overlap)
Multiband (two 10-percent overlap frames every 5 miles)

4. Bexar County (San Antonio): along Interstate 10 from Boerne (intersection with State Highway 46) to beyond county line (about 3 miles southeast of Elmendorf just west of U.S. Highway 181)

Coverage: 12 000 feet above terrain
Ektachrome (60-percent overlap)
Ektachrome (60-percent overlap)
Multiband (10-percent overlap from Boerne to north edge of San Antonio also 10-percent overlap from south edge of San Antonio to end of flight line)

Earth Resources Program High-Frequency Radio Station

1. Call designator: NA4X06

2. Frequency: 9.775 MHz (L) lower sideband

3. Power: 2Kw P.E.P.

4. Location: Building 30
Carl Koontz (Contract)
Phone patch capability through 488/4501

5. Hours of operation: 08:00 to 16:30 (local)

6. Effective date: October 10, 1968, until radio in building 2 is fully operational

TABLE B-I. - EARTH RESOURCES AIRCRAFT PROGRAM

MISSION SUMMARY

(a) Flights made October 14 to 20, 1968

Mission 981 — Aircraft: NASA 926 Convair 240A

Test Sites:

Name	Project Scientist	Discipline
Dallas-Ft. Worth area	M. Chestnutwood	Geography
Tucson-Nogales area	W. Crea	Agriculture
Colorado River Delta area	C. Mason	Hydrology
El Paso area	D. Amsbury	Geology

Instrumentation:

Camera	Film	Filter
RC-8 1	Color IR (8443)	15
RC-8 2	Color (8442)	—
Hasselblad 1	Pan X B&W (3401)	25A
Hasselblad 2	Pan X B&W (3401)	58
Hasselblad 3	Color (SO-121)	2A
Hasselblad 4	Color (2448 Aeroneg)	—

Mission Itinerary:

Date	Test Site
October 14, 1968	Flight 1: Bryan, Waco, and Dallas-Fort Worth; crew commercial to Tucson, Arizona
October 14, 1968	Flight 2: Anson and Snyder; ferry to Tucson, Arizona
October 15, 1968	Flight 3: Tucson area; ferry to Yuma, Arizona
October 16, 1968	Flight 4: Colorado River area
October 17, 1968	Backup date for Colorado area; ferry to Tucson, Arizona
October 18, 1968	Flight 5: Tucson area; El Paso lava fields and ferry to El Paso, Texas; crew commercial to El Paso
October 19, 1968	Flight 6: El Paso area; ferry to San Antonio, San Antonio area; ferry to Houston, crew commercial to Houston
October 20, 1968	Flight 7: Dallas-Fort Worth area; ferry to Houston

TABLE B-I. - EARTH RESOURCES AIRCRAFT PROGRAM

MISSION SUMMARY - Concluded

(b) Flight made October 22, 1968

Mission 981 — Aircraft: NASA 926 Convair 240A

Test Site

Name	Project Scientist	Discipline
175, Houston-Galveston	M. Chestnutwood	Geography

Instrumentation:

Camera	Film	Filter
RC-8 1	Color IR (8443)	15
RC-8 2	Color (8442)	—
Hasselblad 1	Pan X B&W (3401)	25A
Hasselblad 2	Pan X B&W (3401)	58
Hasselblad 3	Color (SO-121)	2A
Hasselblad 4	Color (2448 Aeroneg)	—

60-percent overlap for the RC-8 cameras, 20-percent overlap for the Hasselblad cameras

Mission Itinerary

October 22, 1968; Site 175: Houston-Galveston; departure from Ellington Air Force Base at 09:30 and return at 11:00.

TABLE B-II. - AIRCRAFT MANIFEST

(a) October 14 to 20, 1968

Aircraft Commander	K. Haugen
Pilot	A. J. Roy
Flight Engineer	T. White
Mission Manager	J. Mitchell
Systems Manager	L. Autrey
Photographer	C. Morgan
Photographer	C. Stanley
Data Manager	J. Carney
Agronomist	W. Crea
Geographer	M. Chestnutwood
Geologist	D. Amsbury
Hydrologist	C. Mason

(b) October 22, 1968

Mission Manager	J. Mitchell
Systems Manager	J. Hart
Photographer	C. Morgan
Photographer	C. Stanley
Program Manager	R. Piland
Operations Manager	N. Foster
Project Scientist	C. Chestnutwood

TABLE B-III. - MISSION 981 SCHEDULE

(a) October 14 to 20, 1968

[Time, local]

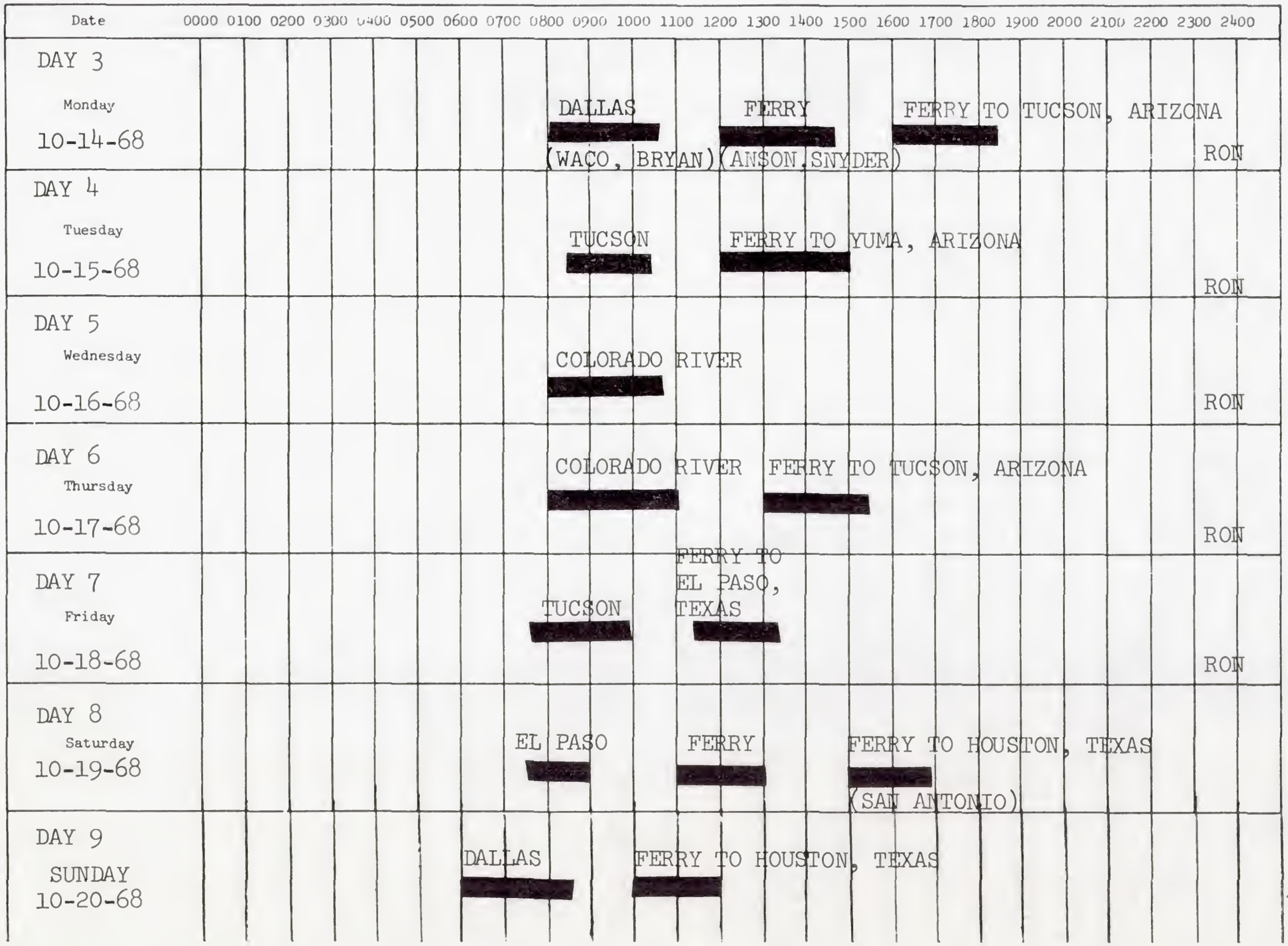


TABLE B-III. - MISSION 981 SCHEDULE - Concluded

(b) October 22, 1968

[Time, local]

Date	0000	0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400
Monday Oct. 21, 1968																									
Tuesday Oct. 22, 1968										T.S. 175															
Wednesday																									
Thursday																									
Friday																									

TABLE B-IV. - MISSION 981 INSTRUMENT SUMMARY

[NASA 926 Convair 240A]

Site:										
Flight and flight line no.	Altitude (absolute)	Flight line length (n. mi.)	Time (local)	Reconofax IV infrared imager	AAS-5 ultraviolet imager	MR62/MR64 M. W. radiometers	13.3 GHz scatterometer	Multiband camera	RC-8 metric camera #1	RC-8 metric camera #2
1-1-1	12000	40	0930					X	X	X
1-5-1	12000	40	0930					X	X	X
1-9-1	12000	21	0930					X	X	X
1-13-1	12000	16	0930					X	X	X
1-17-1	12000	21	0930					X	X	X
1-9-2	3000	21	0930					X	X	X

TABLE B-IV. - MISSION 981 INSTRUMENT SUMMARY - Continued

[NASA 926 Convair 240A]

Site: Dallas/Ft Worth Area										
Flight and flight line no.	Altitude (absolute)	Flight line length (n. mi.)	Time (local)	Reconofax IV infrared imager	AAS-5 ultraviolet imager	MR62/MR64 M. W. radiometers	13.3 GHz scatterometer	Multiband camera	RC-8 metric camera #1	RC-8 metric camera #2
1 - 1	12,000	45						X	X	X
1 - 2	12,000	45						X	X	X
Bryan	12,000	27						X	X	X
Waco	12,000	32						X	X	X
Anson/Snyder	12,000	34						X	X	X
San Antonio	12,000	45						X	X	X

TABLE B-IV. - MISSION 981 INSTRUMENT SUMMARY - Continued

[NASA 926 Convair 240A]

Site: Colorado River Area										
Flight and flight line no.	Altitude (absolute)	Flight line length (n. mi.)	Time (local)	Reconofax IV infrared imager	AAS-5 ultraviolet imager	MR62/MR64 M. W. radiometers	13.3 GHz scatterometer	Multiband camera	RC-8 metric camera #1	RC-8 metric camera #2
1 - 1	15000'	16						X	X	X
1 - 2	15000'	26							X	X
1 - 3	15000'	29							X	X
1 - 4	15000'	31							X	X
1 - 5	15000'	33							X	X
1 - 6	15000'	29							X	X

TABLE B-IV. - MISSION 981 INSTRUMENT SUMMARY - Continued

[NASA 926 Convair 240A]

Site: El Paso Area										
Flight and flight line no.	Altitude (absolute)	Flight line length (n. mi.)	Time (local)	Reconofax IV infrared imager	AAS-5 ultraviolet imager	MR62/MR64 M. W. radiometers	13.3 GHz scatterometer	Multiband camera	RC-8 metric camera #1	RC-8 metric camera #2
1 - 1	14000'	52						X	X	X
2 - 2	14000'	29						X	X	X
2 - 3	14000'	21						X	X	X

TABLE B-IV. - MISSION 981 INSTRUMENT SUMMARY - Concluded

[NASA 926 Convair 240A]

Site: Tucson Area											
Flight and flight line no.	Altitude (absolute)	Flight line length (n. mi.)	Time (local)	Reconofax IV infrared imager	AAS-5 ultraviolet imager	MR62/MR64 M. W. radiometers	13.3 GHz scatterometer	Multiband camera	RC-8 metric camera #1	RC-8 metric camera #2
1 - 1	15000'	21						X	X	X
1 - 2	15000'	14						X	X	X
1 - 3	15000'	11						X	X	X
1 - 4	15000'	17						X	X	X
1 - 5	15000'	12						X	X	X
1 - 6	15000'	15						X	X	X
1 - 7	15000'	15						X	X	X
1 - 8	15000'	1						X	X	X

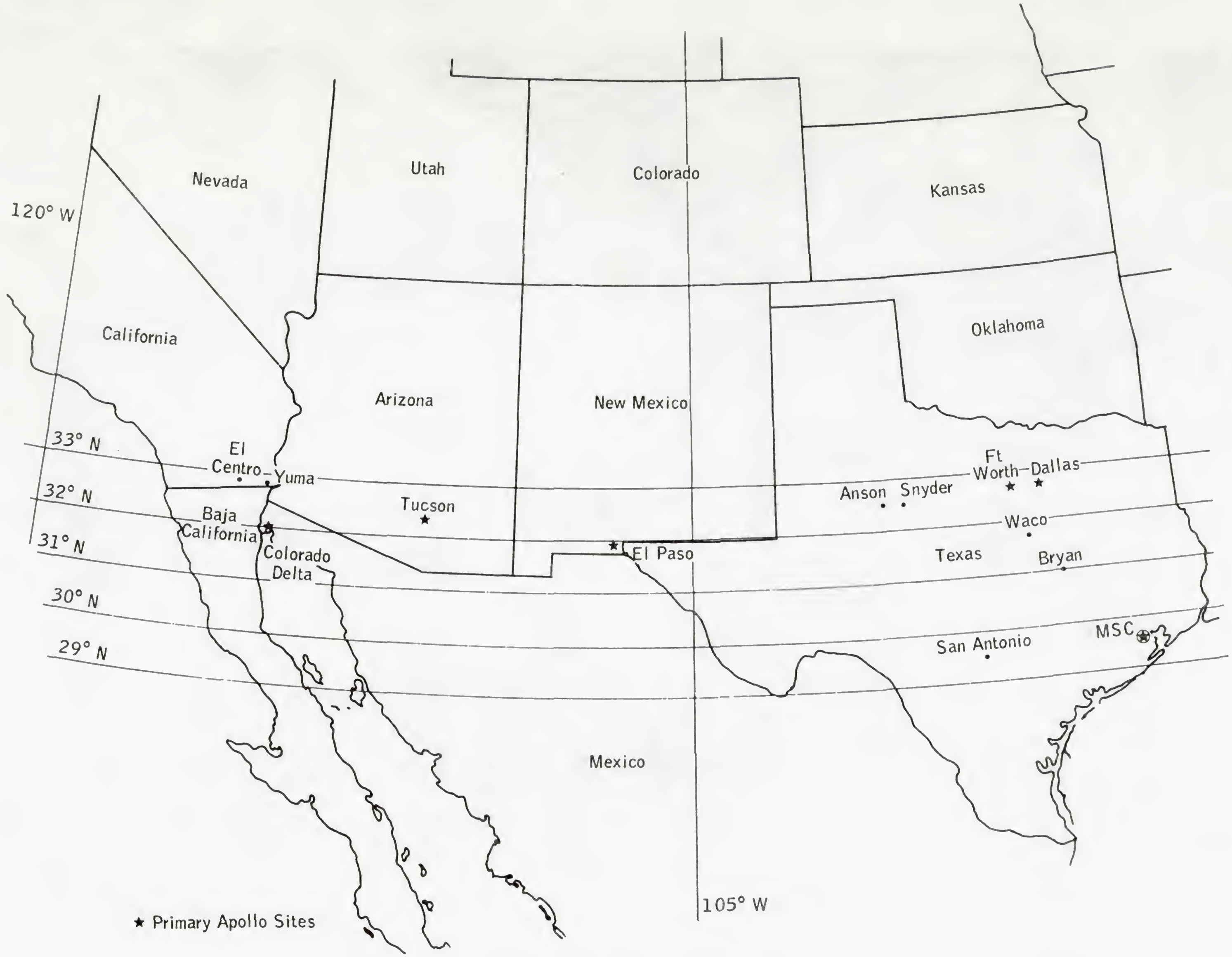


Figure B-1. - Test sites.

Figure B-2. - Colorado River Delta map.

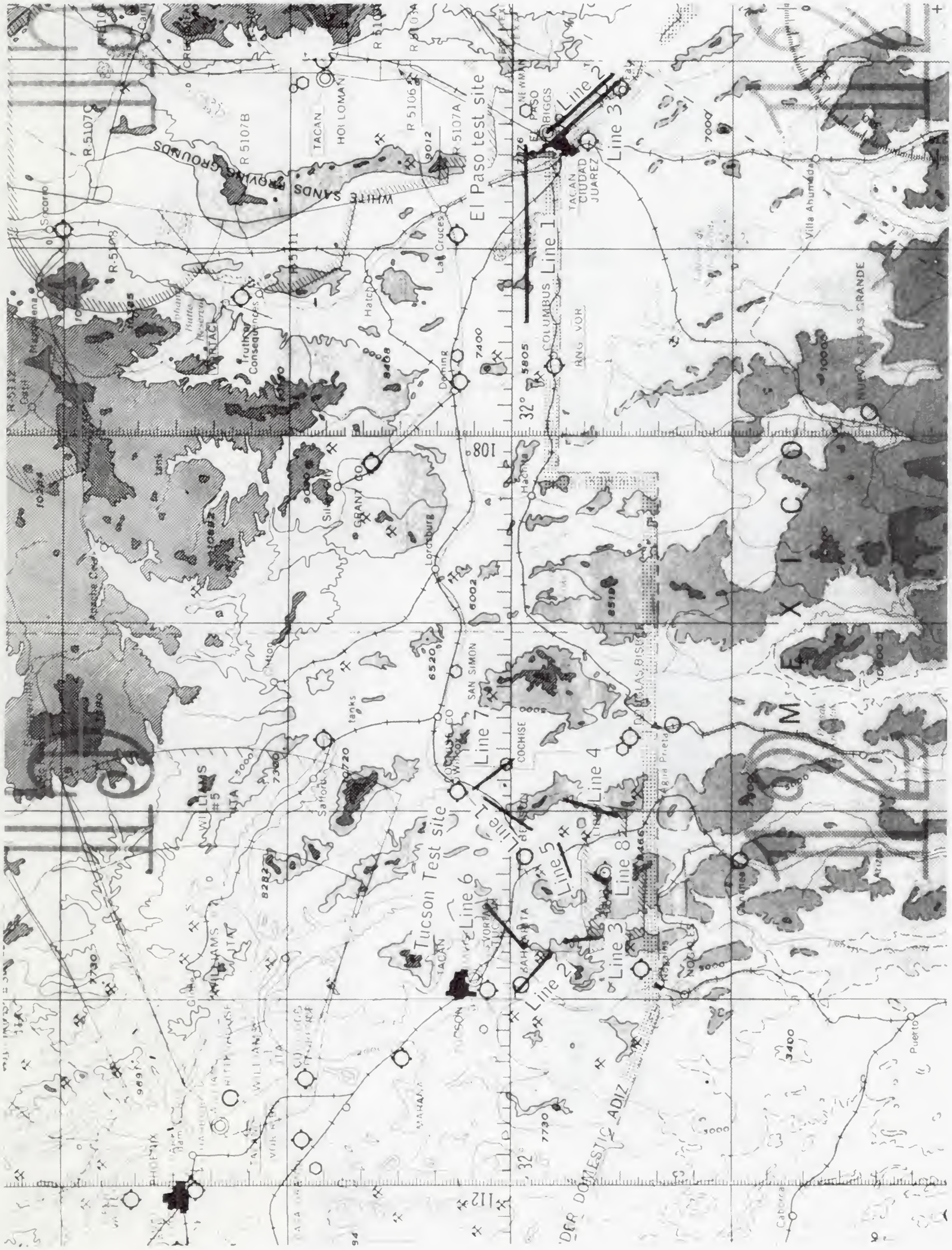


Figure B-3. - Texas-Arizona map.

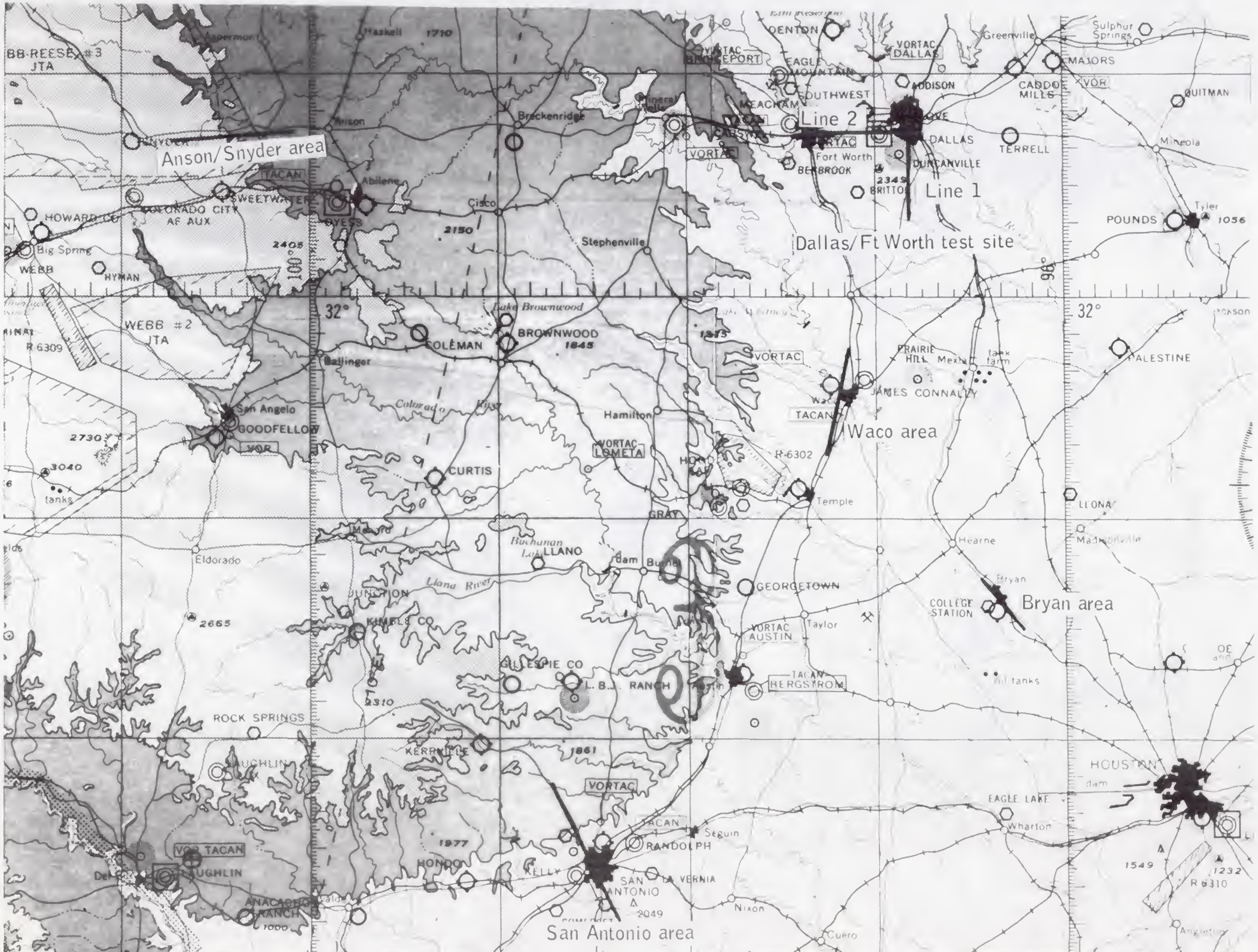


Figure B-4. - Central Texas map.

MSC-7876-69